American Machinist

Volume 57 NEW YORK, AUGUST 24, 1922 Number 8

Some Unique Operations in the Manufacture of Gunsights

Delicate Parts Involve Special Machines and Methods—Fixtures and Tools Developed for the Work—Automatic "Digging" Machine Rivals Milling Cutter

SPECIAL CORRESPONDENCE

AS EVERY mechanic who has ever "toted" a rifle or shotgun is aware, the little device known in gun parlance as the "sight" is a very important adjunct to a gun, for without it the user of the gun would be unable to hit the object at which he aimed. These gunsights are made in many forms, adapted to all kinds of guns, and many of them are provided with very accurate means of adjustment for elevation and windage, comparing very favorably with some of our split-thousandth measuring instruments.

The manufacturers of gunsights are few in number, as the field is somewhat narrow. Their shops, however, contain many ingenious and effective machines and devices designed to perform operations that are perhaps without counterpart in other lines of industry. One such shop, from which a few examples will be cited, is that of the Lyman Gunsight Corporation, located in the little Connecticut village of Middlefield.

The founder of this business, William Lyman, was himself an expert marksman with a world-wide reputation for accurate target shooting, and the business grew out of his early efforts to perfect sights for his own guns. He started nearly fifty years ago in a little wooden building that now appears in Fig. 1 as a very insignificant part of the modern factory.

His first product was practically all hand made, for at that time there was little machinery available for performing the many special operations required by the nature of the work. As the business grew, the necessity for production machinery to replace the slow and tedious hand operations became apparent, and with true Yankee ingenuity he set about designing, and in most part constructing, many of the machines and tools that are here illustrated.

A few of the completed sights may be seen in Fig. 2, which will serve to give the reader an idea of the number and special nature of the parts required. To describe all the fixtures used and operations performed in their making would fill a volume and, therefore, only a few of the more interesting will be attempted.

The part shown in Fig. 3, and in successive operations in Fig. 4, goes upon the outer end of a gun barrel. Though others of similar appearances are adjustable, this one is not and it is made in one piece. It is of importance that the small bead be located exactly in the center of the ring.

The stock from which it is made is received at the factory in bars drawn to the exact section, shown at *a* Fig. 4, and the piece therefore requires no machining or other operations except polishing upon its outer contour. The first step is to cut off the pieces to length in an automatic screw machine, which at the same time produces the counterbore to be seen at *b* in the same figure.

The problem of continuing this counterbored recess to make a through hole, round and true, without disturbing the metal at the center that is later to form the little bead and its slender support is one that requires considerable study. Drilling, punching, broaching, milling and shaving are some of the operations that contribute to its making.

Most of the special tools are shown in Fig. 5, where, beginning at the left of the picture, is the jig by means of which the piece is drilled as shown at *c*, Fig. 4, preparatory to punching out the remainder of the stock. In Fig. 5 the jig is shown inverted and open ready for loading. The work is placed over the central plug of hardened steel in which are the guide holes for the drill,

FIG. 1—FACTORY OF THE LYMAN GUNSIGHT CORPORATION AT MIDDLEFIELD, CONN.

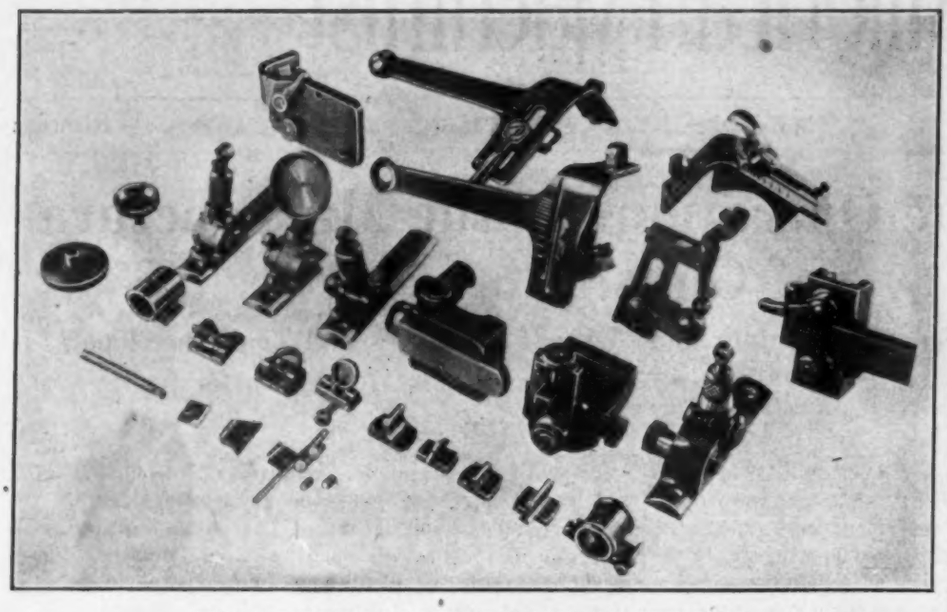


FIG. 2—SOME OF THE MANY FORMS OF GUNSIGHTS

and it is clamped by turning over the latch handle *A*, in the outer end of which is a small cam lever to apply the clamping pressure. The operator now turns over the jig so that it rests upon the ends of the four posts, and drills the five holes shown at *c* in Fig. 4.

The drilled piece next goes to a punch press where the tools shown at *B* and *C* in Fig. 5 punch out the stock at the bottom of the recess without disturbing the metal at the center, leaving the piece as at *d* in Fig. 4. The usual position of the die and punch is reversed in this operation, the punch *B* being attached to the bolster plate and the die *C* held in the press gate. The scrap passes up through a curved hole in the stem of the die and falls out at the back of the gate.

FIG. 3—A SPECIFIC FORM OF GUNSIGHT

On the punch *B* will be noticed two small pins projecting from the shoulder, parallel to the punch. These are ejectors for the purpose of lifting the work off the punch; and, together with a third ejector lying within the slot in the punch, are operated by means of the handle in front of the tool.

This punching operation may be termed "roughing out," for the resulting hole is not to size nor is the bead finished. As will be noticed in parts *d*, *e* and *f* in Fig. 4, there is still considerable metal to be removed from the bead before it reaches its final shape. Because of its slender nature, it would not be practicable to finish it until all the other machining operations were completed. It is shown in the finished stage at *g* in this picture.

Between stages *d* and *e* there are several milling operations which will be described later. The transformations are slight and difficult to show by means of a photograph. The difference between *e* and *f* is that the round hole has been broached to size. The broaching tools are shown at *D* and *E* in Fig. 5. The work is placed in the holder *D* and the loose broach is pushed through by a plain piece of round stock held in the punch holder of the press. The broach passes clear through the work and is caught by the operator as it falls away from the under side of the bolster after passing through the holder.

The tool shown at *F* is the shaving die which reduces the bead to its finished form as shown at *g* in Fig. 4. The work is placed over the projecting stud (in this case a die) and is pushed into it by the round punch *G*. The operation is somewhat unique in that no formed punch is used.

At this stage the rough bead is still flush on one side with the surrounding ring of metal. As the work lies upon the die a small punching of soft iron, shown at *h* in Fig. 4, is laid upon it. As the press gate comes down the work is pushed into the shaving die, while the small amount of scrap removed is swaged into the soft punching as the latter is squeezed between the punch and die. A punching is needed, of course, for every piece shaved, and these punchings are produced at small cost upon an automatic press.

The reason for doing the shaving in this peculiar manner instead of with a formed punch is that in no other way that has been tried is there assurance that the fragile bead will not be distorted or twisted out of its proper relation to the surrounding ring. If such twisting occurs it would be a difficult matter indeed to correct it. The first action of the punch is to force the soft punching partly into the hole, the harder metal of which the work is made forming a partial impression of the bead in the soft iron of the punching, which thus supports the bead on all sides as it passes into the die.

This method could hardly be depended upon to produce clean, sharp edges, but they are not necessary. The following operation, shown in Fig. 6, mills away a part of the bead, leaving it about $\frac{1}{64}$ in. below the surface of the ring and bringing the corners up sharp.

The machine for milling is a special one made somewhat like a bench drill press, but holding a very small end mill. The manner of holding the work by the bead

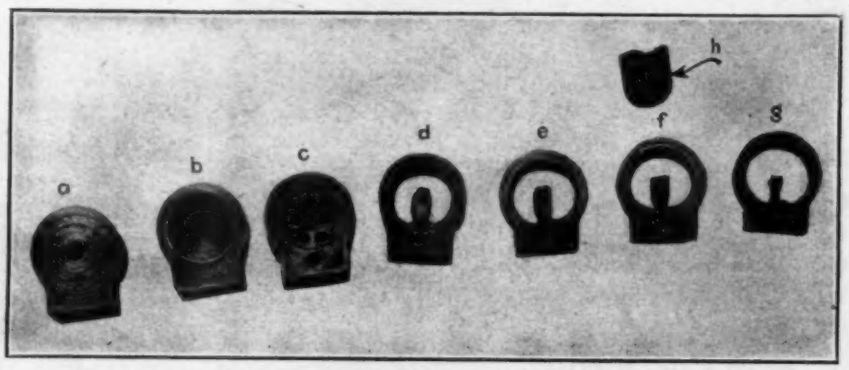


FIG. 4—PROGRESSIVE OPERATIONS ON PART SHOWN IN FIG. 3

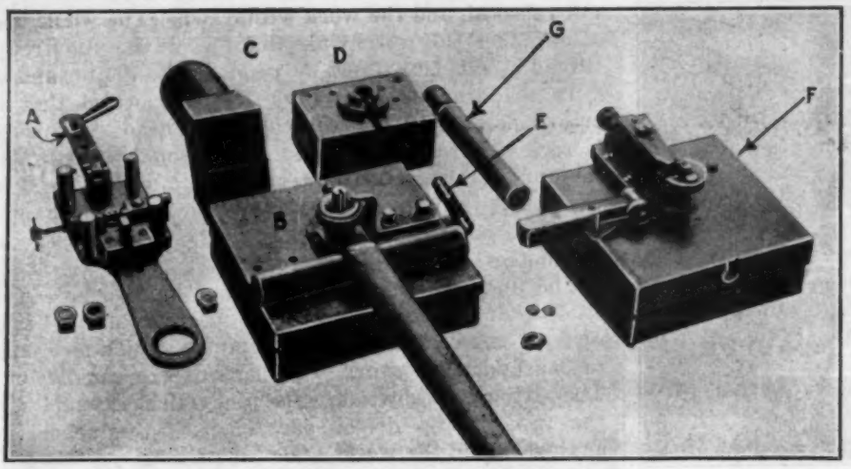


FIG. 5—TOOLS USED IN PRODUCTION OF SIGHT

is clearly shown in the illustration. The jaws of the holding device are in the form of a split stud, the periphery of which fits the round hole, and the two parts of this stud are pinched together upon the bead by means of a cam operated by the small lever. The spindle of the machine is then lowered to a stop and the work fed forward to the cutter by the lower handle.

The milling of the rounded tang to be seen on the last three pieces to the right in Fig. 4 might be thought to be a job for a straddle mill, but it is not so made. The work is done in a device, much used in this shop, called a "flop-over" fixture. Such a fixture is used on many other small parts that must be parallel or definitely tapered. One of the fixtures is shown in Fig. 7 set up for milling a dovetail.

The vise in which the work is held may be considered a two-jawed chuck, as both jaws are moved in unison to and from the center of rotation by means of a right-and-left-hand screw. False jaws are fitted to adapt the device to various shapes of work. The vise, or chuck, in mounted on the end of a spindle that may be rotated 180 deg. and held in either position by means of the toggles, one of which may be seen in action in the picture. There is a similar toggle on the other side of the fixture for holding the spindle in the opposite position, and also an index pin for holding the spindle at the 90-deg. angle if desired. This pin may be seen in Fig. 8, which is the rear view of the same fixture.

The lever *A* Fig. 7, rests in either extreme position upon an adjustable anvil so that though the normal range of movement is 180 deg., this may be varied slightly and by

FIG. 6—A DELICATE MILLING OPERATION

definite amounts by turning an adjusting screw when it is desired to produce slight tapers, as in the case of dovetails that are to be driven to place. The fixture is here shown mounted upon a hand milling machine. It is a very versatile device, however, and is used in this factory in many other places where a reliable three-position indexing fixture is needed. It has proved its worth by continuous service.

Continuous milling fixtures and devices have in recent years become quite common. That the principle is not a new one is indicated by the fact that it is applied in the machine shown in Fig. 9, which has been in service for many years milling parts of gunsights. One of the pieces may be seen at *A* in this figure. A portion of the contour at each end of the piece has been rounded to conform to the curvature of the gunstock of which it is to become a part. In this machine a slowly revolving central spindle carries a mandrel to which the parts to be milled are successively attached by means of countersunk-head screws.

Two cutter spindles carry gangs of formed cutters that may be arranged to suit the size and shape of the

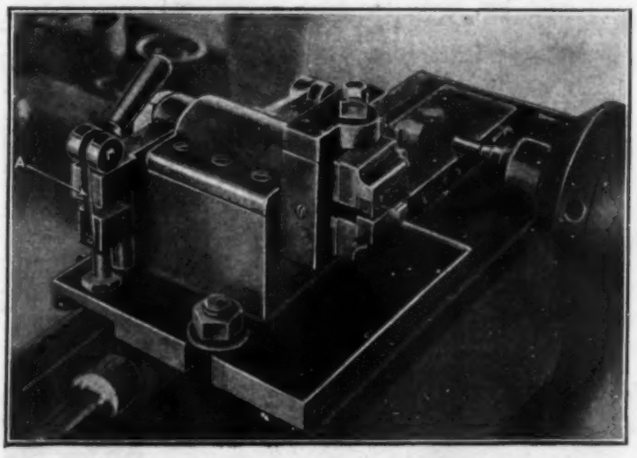


FIG. 7—A "FLOP-OVER" FIXTURE

work in hand. The center distances of the cutter spindles are adjustable with relation to each other and to the work spindle. The milling is continuous, as many pieces as the mandrel will hold being completed at each revolution of the latter. As each piece reaches the top position it is taken off and another one substituted.

In Fig. 10 is a drawing of an elevating screw used in many of the sights, and upon which some of the operations are performed in an unusual way. For instance, the part that looks like a small rack is in reality a portion of a square thread. If this thread were continuous any toolmaker would at once suggest that it be cut with a die upon a screw machine; but because of its lack of continuity, this method would seem to be out of the question. That it may be so cut, despite its peculiarities, the little machine shown in Fig. 11 amply demonstrates.

In the chuck of this machine is mounted an ordinary single-piece die of square shape and proper thread characteristics, while held stationary within the spindle, just back of the die, is a bushing fitted to the stem of the

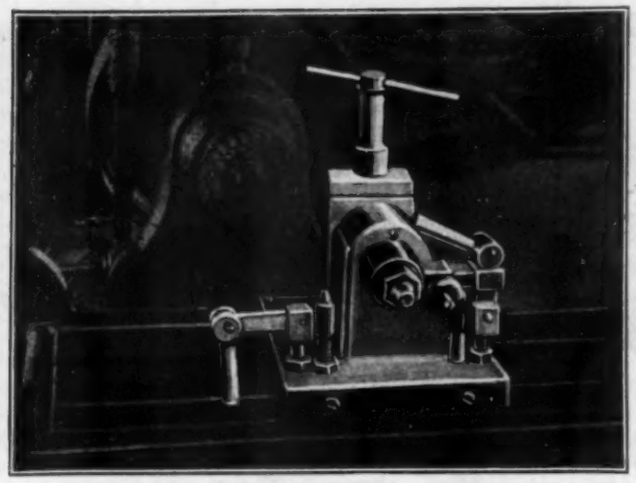


FIG. 8—REAR VIEW OF SAME FIXTURE

screw and having a slot or keyway to allow the threaded part to pass. Geared to the spindle and extending under the slide in which the work is held is a left-hand lead screw of the same lead as the die. A split nut, operated by the thumb-nut *A*, may be closed upon the lead screw at the will of the operator.

With one of the parts gripped in the holding clamp the operator moves the slide forward until the round stem of the screw has entered the bushing, then closes the split nut upon the lead screw. The slide is thus

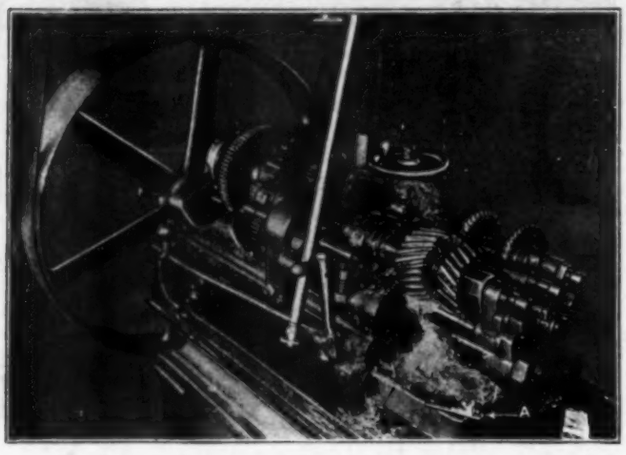


FIG. 9—A CONTINUOUS MILLING MACHINE

carried forward at the same rate of advance as if the die were cutting, until the spline to be threaded has passed clear through the die, the thread being cut thereon in its passage. The machine is now stopped, the spindle turned by hand to bring one of the clearance spaces of the die opposite the threaded spline, the split

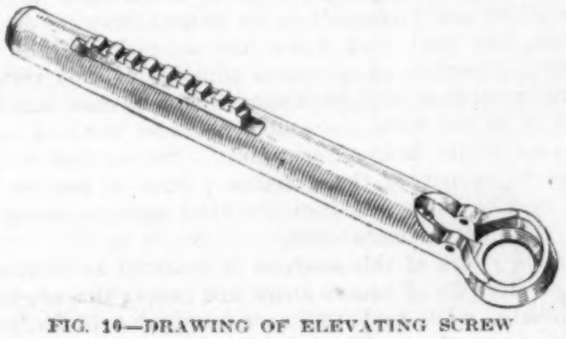


FIG. 10—DRAWING OF ELEVATING SCREW

nut released, and the work withdrawn. The whole operation takes no more time than would be required to thread a complete screw by running the die on and off.

In the drawing Fig. 10 it will be noticed that the cross-hole passing through the round head of the screw is recessed from both sides. This would seem to be a job for an ordinary counterbore or a hollow mill, but these tools have been tried and discarded in favor of the little machine shown in Fig. 12, in which the work is done by a single-point tool.

The piece to be counterbored is slipped over a short stud arbor in the spindle of the machine and is backed up by a cup center in the tail spindle, which is brought to bear upon the work by means of the cam lever *A*. The driving is done by the pin which extends from the face of the driver parallel with the arbor, and against which the work is shown resting.

Another pin extending radially from the periphery

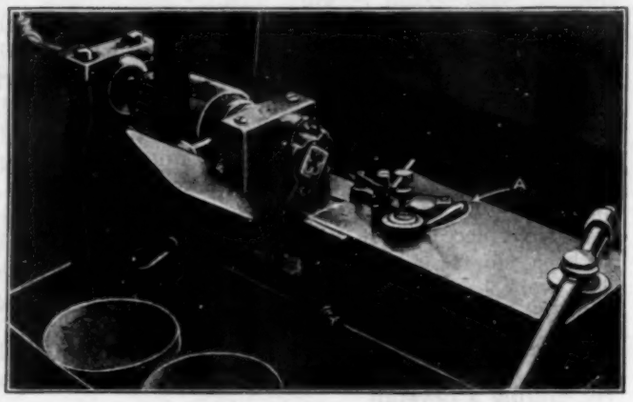


FIG. 11—THREADING THE SCREW

of the driver engages the short studs in the face of the small wheel *B*, which thus becomes a sort of crown gear driven by a one-tooth pinion. This wheel is mounted by means of a spring-adjusted friction upon a short shaft that is geared to what may be termed the lead screw of the tool slide *C*

When the machine spindle is revolved the wheel *B* revolves, though intermittently, and through the friction device turns the screw forward to feed the formed

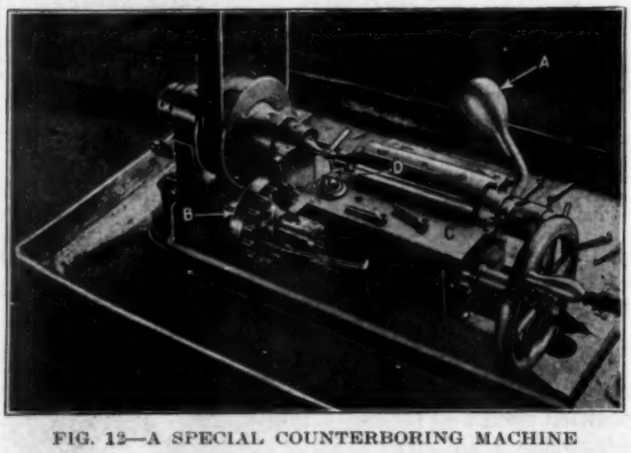


FIG. 12—A SPECIAL COUNTERBORING MACHINE

cutting tool *D* into the work. The forward movement of the tool slide is limited by a stop which regulates the depth of the cut and makes all parts alike as regards depth of the recess. When the limit is reached the wheel *B* continues to turn as long as the machine is

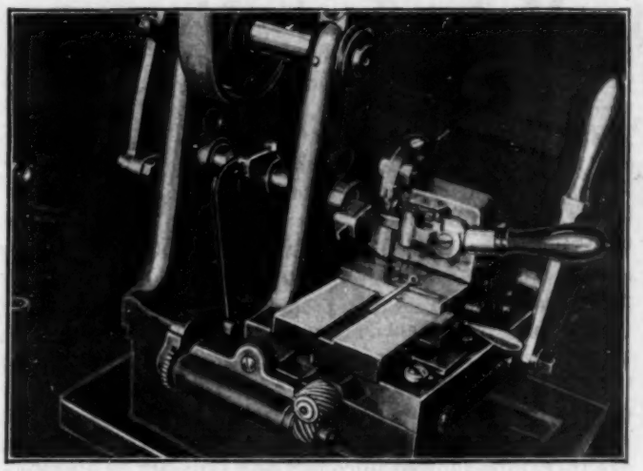


FIG. 13—"DIGGING OUT." A METHOD THAT COMPETES WITH MILLING

running, but because of the slippage of the friction no turning movement is imparted to the screw.

Should the tool become dull and refuse to cut as fast as it ought, the friction slips and adjusts the feeding pressure to accommodate the reduced efficiency of the tool. The feeding will continue, however, until the established depth of recess has been reached and the

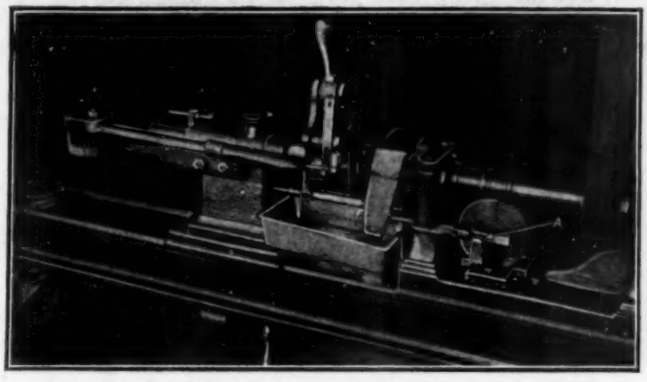


FIG. 14—OLD MACHINE FOR KNURLING

stop engages, which point is indicated by the stoppage of the handwheel at the right which is keyed to the screw. The tool may be withdrawn from the cut at any time by turning back the handwheel, slight effort being required to overcome the resistance of the friction drive.

If Whitney cutters could have been purchased fifty

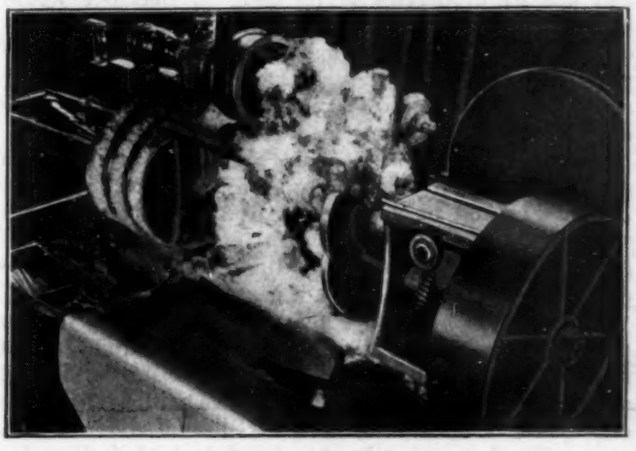


FIG. 15—HARTFORD AUTOMATIC PRODUCING IVORY BEADS

years ago at present-day prices, the machine shown in Fig. 13 probably never would have been built. As they could not, and as the small groove that cuts radially into the deeper recess in Fig. 10 had to be made, this machine was designed to do the work.

Except for unloading and reloading, the machine is automatic in its movements. The work (the piece, Fig. 10) is clamped upright in the vise with the deeper recess facing the tool held in the cutter head *A*. This cutter is ground as an ordinary parting tool, and the head gives it a peculiar rocking motion actuated by two pitmans, one of which may be seen at the left and the other between the housings, both being driven from the horizontal shaft above. The forward movement of the tool is analogous to the action of a fly cutter, or single-toothed milling cutter. Reaching the end of its stroke

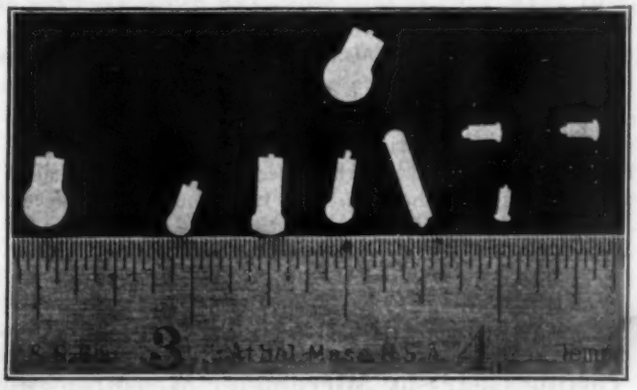


FIG. 16—SOME OF THE BEADS PRODUCED

it is withdrawn slightly, rotated backward, and again advanced to the cut. The cross-slide and work is in the meantime moving slowly and continuously forward toward the tool until the pre-determined depth of cut is reached, when it unlocks and recedes.

The machine is very rapid in its action; so rapid in fact that the eye cannot follow it. If the job were up today for consideration, a special milling machine using

FIG. 17—A VETERAN EMPLOYEE

Whitney cutters would doubtless be selected; but to make the change now would involve the design and construction of an entirely new machine which, when completed, would neither increase production nor produce better work. It is on that account, therefore, that this ingenious device remains on the job.

One part of certain gunsights requires a small care-

fully knurled handle and, contrary to usual practice, four knurls are used to produce it. These knurls are mounted upon the compound lever compensating device shown in Fig. 14 on the tail spindle of the machine. With the work held in the chuck the knurls are brought forward by means of the lever-operated rack and pinion, the compensating levers are brought together by the small handle at the top, while at the same time the "nut" on the slide *A* is pressed into engagement with the constantly turning scroll.

The slide is, of course, attached to the tail spindle and draws the knurls forward over the work until the length desired has been knurled, when the knurlholder is automatically released and the nut thrown out of the scroll. This machine is also a rapid producer and, despite its age, it would be difficult to design a machine to beat it.

Making Ivory Beads On a Screw Machine

In Fig. 15 is shown a machine that appears to be operating under a snow drift. This machine has no special claim to distinction as it is one of the early Hartford automatics and has many counterparts still at work throughout the country. It is doubtful, however, if any of the others are handling the same kind of material, for the product is some one of the many small beads shown in Fig. 16, and the material is ivory.

The ivory comes to the machine in the form of short round rods, some of which may be seen in the little pan on the base of the machine. These rods are fed through the hollow spindle, one pushing another, by means of the usual form of wire feed. When a short end is reached it is either thrown out of the collet or is knocked out by the cutter, the result being only that the machine makes one idle cycle. Some of the tools used are the same as would be employed upon similar parts of steel, but all the forming is done by revolving cutters.

The machine is entirely automatic in its action and its attendant has many other duties to perform while "keeping his eye on it." One of the things that he does *not* do, however, is to clean off the chips. Ivory readily absorbs, and is discolored by, oil. The chips are therefore allowed to collect and thus act as a protection to the product by catching up any stray drops of oil that may be thrown off by the revolving parts of the machine.

Besides veteran tools, the company has some veteran employees. Though the founder of the business has long since passed away, several of his early associates are still on the job. One of them may be seen in Fig. 17 at the work in which he has been engaged for nearly half a century. He is "going to die right on this stool; but not for a long time yet;" as he himself says.

Testing Gears by Micrometer Measurement —Discussion

By Fred Ross Eberhardt
Gear Department Manager, Newark Gear Cutting Machine Co.

In an article under the above heading on page 195 of *American Machinist*, S. O. Gordon gives some interesting formulas for use in making micrometer measurements of gears over plugs. We wish to compliment Mr. Gordon on his mathematics, although we question the value of gear measurements made in this manner. Some of the worst running gears that the writer has seen have passed a careful inspection of this kind.

An involute gear, as such, has only two unchangeable characteristics; namely, the number of teeth, and the diameter of the involute base circle. The pitch diameter depends entirely upon the mating gear and the center distance. This fact being the case, it is clearly impossible to measure the pitch diameter of any one gear by itself. Suppose a certain pitch diameter is assumed arbitrarily. If the teeth should be cut 0.001 or 0.002 in. too thin they would still be within the limits required for most work, but a measurement over plugs would seem to indicate that the pitch diameter was undersize. Of course, this would be erroneous.

The only gear test of value is some sort of a running test, which may be supplemented by a micrometer measurement of each tooth if desired. The gears should be mounted on true running spindles set at the same center distance at which the gears will actually operate and should be run at a fairly high speed under load. A good testing speed is approximately 1,000 ft. per min. pitch line velocity. This velocity may be roughly calculated as being equal to $\frac{1}{4}$ r.p.m. $\times$ pitch diameter (in inches). A load may be applied by means of a brake, a stick of wood or a piece of belting.

The gears should be run in both directions. Any inaccuracy in tooth spacing, as well as an eccentricity, thick teeth, or gear running out, will be shown up at once by the noisy operation. An incorrect tooth form will also be apparent, from the noisy operation and from an examination of the bearing area on each tooth. When the gears are on the centers, tests for backlash may be made by shaking one gear while the mating gear is firmly held.

If it is not convenient to make a power test as outlined, the gears may be mounted on spindles set at the correct center distance and revolved by hand. This test should be accomplished by turning one gear very slowly, and resisting the movement with the other gear. If no delicate rumbling or bumping is felt as the teeth are engaged and disengaged, and if a satisfactory bearing is shown, it is likely that the gears will not operate noisily because of any inaccuracy in the teeth.

It is very difficult, if not impossible, to test any one gear by itself, and to be certain that the gear will run satisfactorily. Every gear is one of a pair or a train, and has no properties of its own, so that one would hardly know what to measure on a single gear. The correct way should be to make up a mate, and test the pair. If this could not be done, perhaps the best alternative would be to make a clay mold, using the gear as a core, and to cast a lead form. Testing the gear in every different position of the lead form shows up any inaccuracy in spacing as well as the variation in tooth form and tooth thickness. Any of these errors would prevent the gear from fitting the lead form except in certain positions and yet in spite of these errors the gear might operate perfectly.

Where there are many gears to be tested, a testing machine may be used, with a hardened and ground master gear. Variations in the center distance, as well as backlash and thick and thin teeth will be noted at once without a running test. If quietness is desired, a running test, or at least a hand test of feeling for any rumble, is necessary.

Methods of Machine Tool Design

Sixth Installment of Chapter V Discusses Back Gears—Arrangements for Light and Heavy Drives—Double Back Gears—Objections to Back Gears

BY A. L. DE LEEUW
Consulting Editor, *American Machinist*

PERHAPS no speed variator is so well known as the back gear, especially when it is used in combination with the cone pulley. There is a quite general belief that back gears are so called because they are generally located at the back of the lathe headstock. However, the location has no more to do with their name than with their action. They are called back gears because their action brings the drive *back* to the shaft from which it was taken. The term "back gears" simply means "return gears."

In their best known form, they are arranged as shown in Fig. 109. *A* is the shaft (generally a spindle) upon which the cone *B* runs. Keyed to this cone is pinion *C* which drives gear *D*. The gear *D* is connected to pinion F through sleeve *E*. Finally *F* drives the face gear *H*,

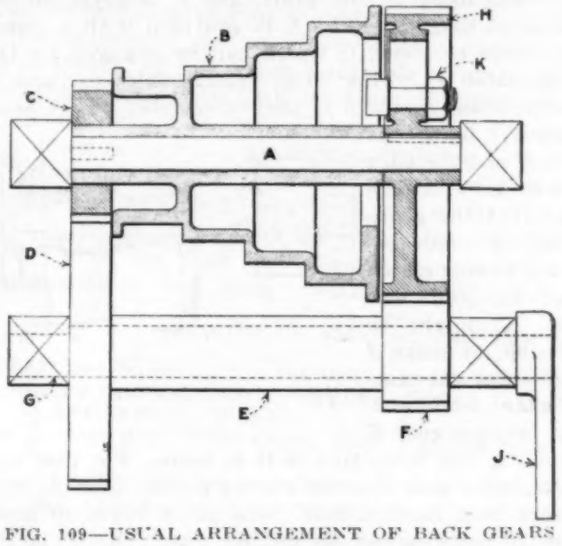


FIG. 109—USUAL ARRANGEMENT OF BACK GEARS

which is keyed to the spindle. Under these conditions the spindle speed equals cone speed $\times \frac{C}{D} \times \frac{F}{H}$.

However, it is possible to disengage *F* from *H*, and *D* from *C* simultaneously. For this purpose sleeve *E* is made to run on an eccentric shaft *G* which can be turned by handle *J*. When this is done cone *B* is free to turn on the spindle, without affecting face gear *H*. This gear has a slot in which a block can slide in a radial direction. The block can be clamped in position by nut *K*. The cone is provided with an inner rim, into which one or more notches have been cut. By pushing the block into one of these notches and locking it, cone and face gear are connected and run together.

For light machinery a somewhat simpler lock is used which can be operated without a wrench. It consists of a pin which is pushed into one of a number of holes in the face of the cone. The entering edge is beveled. The other end is provided with a knob. The pin and the spring which assist in pushing it into the hole are contained in a bushing which is driven or screwed into the face gear. When the pin is withdrawn from the cone it is prevented from jumping back by a cross pin which rests in a shallow groove in the top of the bushing. When the pin is in action this cross pin rests in a deeper slot, as shown in Fig. 110.

CONSTRUCTION OF ECCENTRIC SHAFT

As a rule the eccentric shaft *G*, Fig. 109, is made in one piece which may cause it to be quite large, thus compelling the use of a rather large pinion *F*. The small part of the eccentric shaft should be kept large enough to permit of a substantial handle being attached to it. If the face gear is of 3-P, then the throw of the eccentric would have to be more than $\frac{3}{8}$ in., let us say $\frac{1}{2}$ in. Fig. 111 shows how this eccentricity affects the dimensions of the shaft. For the turning (or grinding) of this shaft, two centers are required O_1 and O_2. These centers are $\frac{3}{4}$ in. apart. In order to have sufficient supporting metal around O_1, the distance O_1A should not be less than $\frac{1}{4}$ in., so that O_2A is not less than 1 in. This makes O_2B also 1 in. O_1B is therefore $1\frac{3}{4}$ in. and consequently the diameter of the large shaft cannot be less than $3\frac{1}{2}$ in. In general, if the eccentricity is *E* and the amount of metal around the center is *t* ($O_1A = t$), then

$$d = 2(E + t)$$
$$D = 2(2E + t)$$

It may be necessary to keep the large diameter of the eccentric shaft down to a convenient size. This can be done by having O_1 fall outside of the eccentric. (See Fig. 112). This arrangement has the disadvantage that it becomes very difficult to turn or grind the main part of the shaft. To avoid this difficulty and for other reasons, of which more later, the shaft is made straight and eccentric bushings are pinned on, as shown in Fig. 113. This makes it possible to make the shaft of any convenient diameter. Under the conditions as shown in Fig. 113,

$$D = 2R = 2\ (E + \tfrac{1}{2}\ d + t_1) = 2E + d + 2t_1$$

It is of course necessary to pin the bushings to the

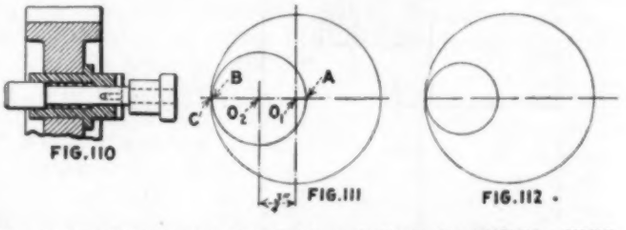


FIG. 110—PUSH PIN LOCK FOR A LIGHT MACHINE. FIGS. 111 AND 112—SOLID ECCENTRIC SHAFTS

shaft before finish turning or grinding so as to have them in proper alignment. For assembling the shaft in the frame, one of the bushings may be removed, the shaft inserted in the frame, and the bushing replaced. To meet this method of assembling, the pin, connecting bushing to shaft, is shown as going through the flange (which is always outside the bearing and accessible).

For the author's forthcoming book. All rights reserved.

The end of the eccentric shaft with its two centers, O_1 and O_2, is shown in diagrammatic form in Fig. 114. It shows that the back gear pinion will approach the face gear whether we move the eccentric along arrow 1 or along 2. However, in the one case, the gears will have a tendency to pull in, and in the other case, they will resist the meshing. The movements should be such as to keep the gears in mesh, and the end of the movement should be close to, but not quite up to, the center.

The tendency to pull the gears into mesh or push them apart is not quite so strong as might be supposed at a first glance. This is due to the fact that, whereas pinion *C*, Fig. 109, may have a tendency to push the

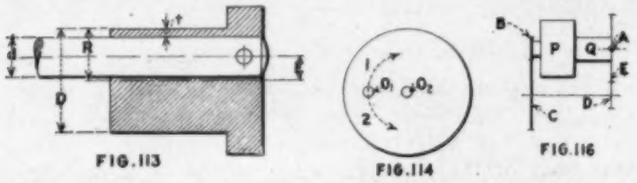


FIG. 113 FIG. 114 FIG. 116

FIG. 113—ARRANGEMENT OF ECCENTRIC BUSHING. FIG. 114—DIAGRAM OF END OF ECCENTRIC SHAFT. FIG. 116—ESSENTIAL ELEMENTS OF BACK GEAR ARRANGEMENT

gears out of mesh, pinion *F* has a tendency to pull in. It is true that these tendencies do not equalize each other because the tooth pressure is greater on *F* than on *C*; nevertheless, the total effect has been reduced. There should be a stop to prevent further movement under the pressure of the teeth. This stop is sometimes merely a pin butting against the end of a milled groove. This is sufficient for light load, but when this construction of back gears is used for heavy machinery, a more substantial stop should be provided. Besides, it is not safe to depend entirely on the tooth pressure to keep the gears in mesh. Vibration may tend to throw the gears out unless a positive lock is provided. Fig. 115 shows a light construction with stop and locking device. For heavier constructions the shaft is generally provided with eccentric bushings, as was described. This makes it possible to cut away part of

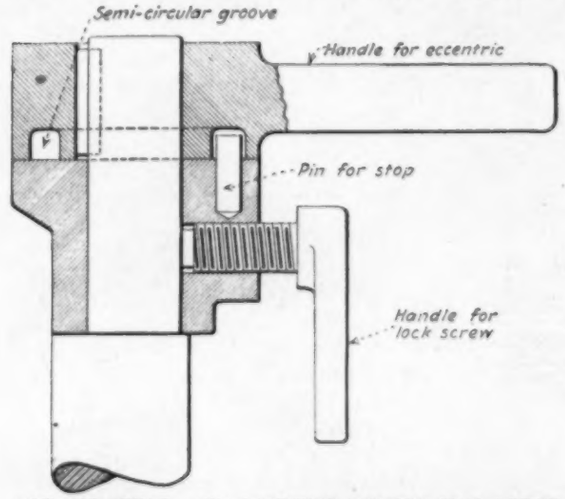


FIG. 115—STOP AND LOCKING DEVICE FOR LIGHT BACK GEARS

the flange of one bushing and make the end butt against a block screwed, and perhaps keyed, to the frame. The bearing may be split and the shaft locked by a binder screw.

Though back gears are best known in combination with a cone pulley, they are by no means confined to this combination, nor is it essential that an eccentric shaft be used or a spring plunger or sliding block to connect face gear and cone. Fig. 116 shows the essential elements of a back gear arrangement. There is a member *P*, running loose on shaft *A* and driven from some source, a belt or gear or perhaps a complete speed variator. This member, through its pinion *B* and the gears *C* and *D*, drives a gear *E* keyed to shaft *A*. There is further a member *Q* which can clutch *P* to *E*. Finally, there must be some way to make gears *C* and *D* inactive when *P* and *E* are connected. It is not even necessary that *E* should be keyed to *A*. In case *E* is loose on a shaft, *Q* is a member which is keyed to *A*, and which can be clutched either to *E* or *P*. It is no longer necessary with this construction to put *C* and *D* out of action when the drive goes through *E*, though it is desirable. Such a construction of the back gear is quite common to screw machines, chucking machines, etc., where quick and handy operation is of prime importance. In such constructions the member *Q* is generally a double acting friction clutch.

Another construction which permits of quick operation without the disadvantage of idle running gears, is diagrammatically shown in Fig. 117. Here the member *P* runs loose on the shaft, and *E* is keyed to the shaft as in diagram 116. *E* is provided with a clutch (jaw clutch as shown), which can be engaged by the sliding clutch *F*. This latter clutch slides on, and is keyed to, a sleeve which is part of member *P*. A lever *G* moves both the clutch *F* and the back gears *H* and *I* in such a way that the gears are out of mesh before the sliding clutch enters *E*, and vice versa. It might be impossible to make *J* and *H* enter the mating gear simultaneously, because gear *E* is standing still when this shift is made. For that reason, the other gear *J*, or its mating pinion, is made with an extra long face so that these gears begin to mesh before *H* has reached its mating gear. As *P* is the driving member in this arrangement, it is necessarily running when the shift is being made, so that *J* can enter *K*. This causes *H* to run, thus permitting it to enter *E*.

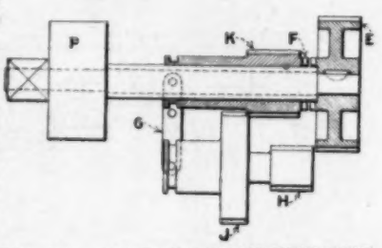


FIG. 117—CONSTRUCTION WITHOUT IDLE RUNNING GEARS

There are, of course, many ways, one might say an unlimited number of ways, to construct the arrangement called *back gears*. The foregoing will suffice to show that the essentials lie not in the way the details are arranged but in the fact that a shaft is driven direct from a member located on this shaft or through the intervention of a set of gears located on another shaft.

Referring again to Fig. 116, it will be seen that *P* might be provided with a number of pinions and that there might be a number of gears *E* on the shaft. We would then have to provide a number of gears *C*, each one to mesh with one of the pinions *B*, and a number of pinions *D*, each one to mesh with a gear *E*. Of course there should be some means of selecting the gears *C* or the pinion *D* which we wish to use, as only one of a set could be used at one time.

A construction of this nature is the so-called double back gear, which is shown in diagram in Fig. 118. There are two pinions, B_1 and B_2, which we can mesh

either with C_1 or C_2. These two latter gears slide on the quill on which pinion D is located, and they are often made to slide by hand without any mechanical means. The arrangement of the pinions and gears B and C differs somewhat from the ordinary sliding gear arrangement. Ordinarily, a little more than two spaces is required between the pinions B_1 and B_2 so as to make it possible for the gears C_1 or C_2 to get out of engagement with one of the pinions before they get into engagement with another. With the sliding back gear, a single space between B_1 and B_2 is sufficient because, when shifting the gears C_1 and C_2 one can throw the back gear shaft out of action completely by means of the eccentric before making the shift to the other speed.

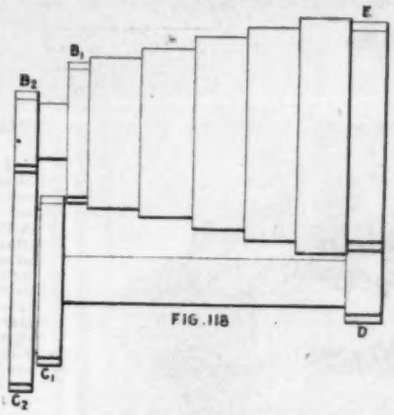


FIG. 118

FIG. 118—DOUBLE BACK GEAR

An arrangement such as shown in Fig. 118 has three sets of speeds: all the speeds obtainable by shifting the belt on the cone with back gear out, the cone shifts of belt with the fast back gear in, and, in the third place, these same shifts again with the slow back gear in. Assuming that there are four steps in the cone and that the slow back gear is in, we might call the speeds, a, ar, ar^2, ar^3. Then the speeds will be ar^4, ar^5, ar^6, ar^7 when the fast back gear is in, and ar^8, ar^9, ar^{10}, ar^{11} without back gear. Referring to Fig. 118 we see that $\frac{B_2}{C_2} \div \frac{B_1}{C}$ must be the ratio between slow and fast back gear speeds when the belt is on the same cone step, because in either case, whether slow or fast, the ratio $\frac{D}{E}$ is in use. This shows that it is not possible to have a very wide range between slow and fast back gear, and this makes this arrangement particularly adapted to cases where the total range of speeds is not very wide and where the speeds should be close together. As illustration we will take a machine in which the speeds range from 13 to 351; that is, a equals 13, and ar^{11} equals 351, so that r^{11} is 27, and therefore $r = 1.35$; $r^4 = 3.315$, and this is the ratio between slow and fast back gear. If we should make B_1 and C_1 equal, we would have to make the ratio between B_2 and C_2 equal to 3.315 and make this same ratio between D and E. It is perfectly feasible to do so. If, on the other hand, we should have found that $r^4 = 5$, we would have found it extremely difficult, or rather awkward, to make the pinions B_2 and C_2 with such a large ratio.

It might be remarked that the ratio between two adjoining steps is rather large, namely 1.35; but this is entirely due to the fact that we have only four steps on the cone. If we had more steps, this ratio would be reduced. We can thus reduce that ratio by taking two countershaft speeds, which will have the same effect as if we had eight steps on the cone, in which case the ratio between two adjoining steps would be

$$\sqrt{1.35} = 1.162$$

Though a back gear arrangement, in its typical form, is simple in design and construction, it is gradually being superceded by other arrangements on account of a certain unhandiness in its manipulation which is almost unavoidable. The shifting of the lock is very often awkward, because the wrench must be applied between the frame of the machine and the face gear where there is very little room. If the lock should be in a position where it is not accessible, it becomes necessary to pull the belt around. Furthermore, modern construction requires safeguards for the belts, and such safeguards should be permanent. They should not be removable shields which may be forgotten when they have once been removed. When such permanent shields are used it may become entirely impossible to reach the sliding block. The back gears themselves, also, present a more or less unsightly appearance. They and their guards form large projections on the frame of the machine and detract from its symmetry.

Machinery Quotations for Our Export Trade —Discussion

BY L. B. GEROLD

The writer has read with interest the points set forth by Mr. Wearin in his article under the above title which appeared on page 174 of *American Machinist*. Although short, the article contains much food for thought for American manufacturers and agents who contemplate carrying on an export business.

A quotation "Free on Board Ship; Freight and Insurance Paid" involves more than is apparent at first glance. Among other things it places the responsibility for the shipment on the shoulders of the manufacturer until the goods have arrived safely at foreign port. Accidents during the voyage, be they due to any causes such as breakages, marine risks or losses of any sort, will involve him in long drawn out controversies and trouble, not only with the transportation companies but with the customer. Besides this such a quotation contains a speculative element as transportation costs are subject to considerable fluctuations.

Why assume unnecessary risks or deal in futures when a simple "f.o.b. American Port" quotation will prove acceptable to all interested. I do not mean to imply that one should quote inflexibly this way for there may be conditions that might modify it at times, but my experience has proved that the average foreign inquirer, who desires to deal direct, understands the steps and costs involved in obtaining his goods; also the channels through which he can obtain the necessary information to enable him to calculate intelligently the ultimate price to him.

As Mr. Wearin remarks, it cannot be reiterated too often that manufacturers should give the gross and net weights and the shipping dimensions. It is also very much worth while that careful study be made of the product with a view of packing it in the least possible cubic space. A very recent case comes to my mind of where, by detaching certain readily removable parts from a machine, there would have been a saving of 35 per cent in the ocean freight. Attention to these details increases the chances of competing favorably against the exceedingly keen foreign manufacturers. Don't create a masterpiece and then put it in the hands of a carpenter and his assistant for the finishing touches unless you know he is doing right. The maintenance and growth of our foreign trade requires that thought be put on the details connected with the work.

SPECIAL AUTOMOTIVE

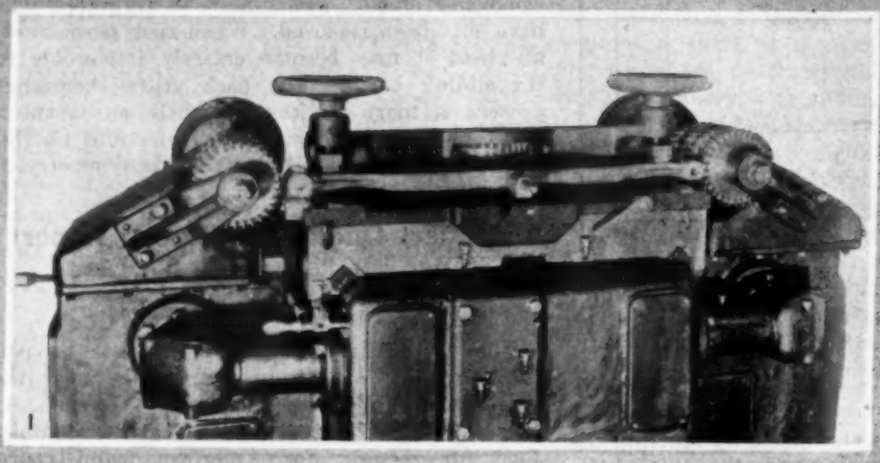


Fig. 1—Special Newton milling machine for tractor front axles. After axle is in place the table moves work in against the vertical milling cutters in the center. Then the heads at each end are fed in, the yokes milled for the steering knuckles, and the heads move out again. The table then moves out for reloading. The movements are cam operated.

Fig. 2—Newton drum type machine milling tops and bottoms of cylinder blocks. Upper mills rough before lower mills finish.

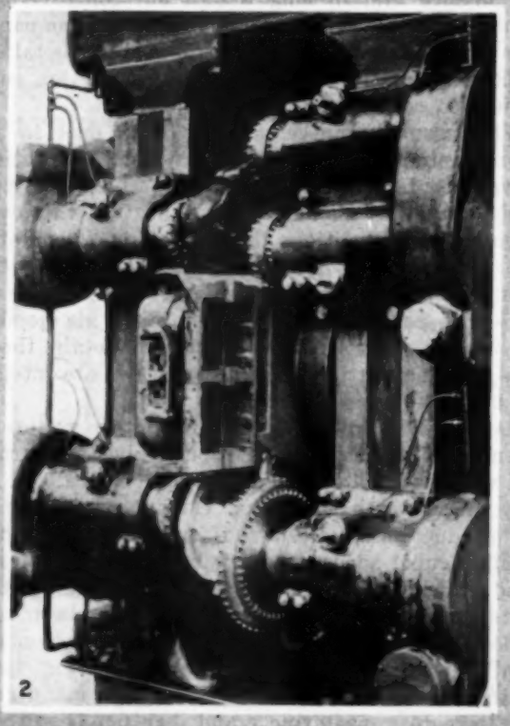
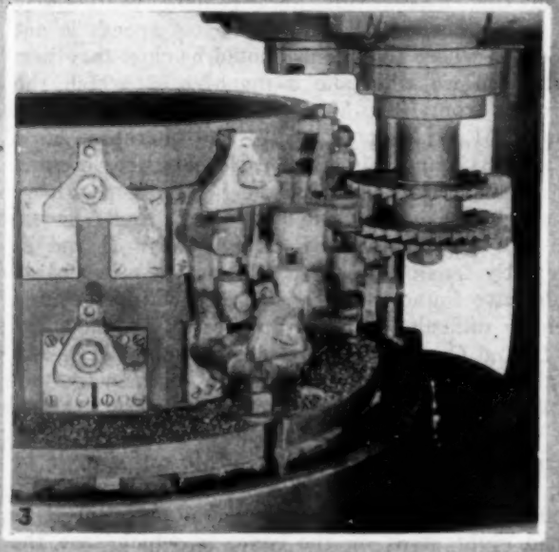


Fig. 3—A Newton milling machine for small work. There are two vertical spindles although the finishing cutters only are shown in position. Work is clamped to a ten-sided drum fitted with proper locating pieces for holding two pieces on each face. Roughs and finishes at one pass of the work past the cutters.



MACHINING METHODS

Fig. 4 — Hoefer milling machine for front axles. Forgings are held on a four sided drum which is mounted on a knee that is fed upward to the cutters by cams below the rollers shown. The work drum is indexed by the hand wheel at the right. Can be equipped to mill jaws for steering knuckles. Production time 12 minutes.

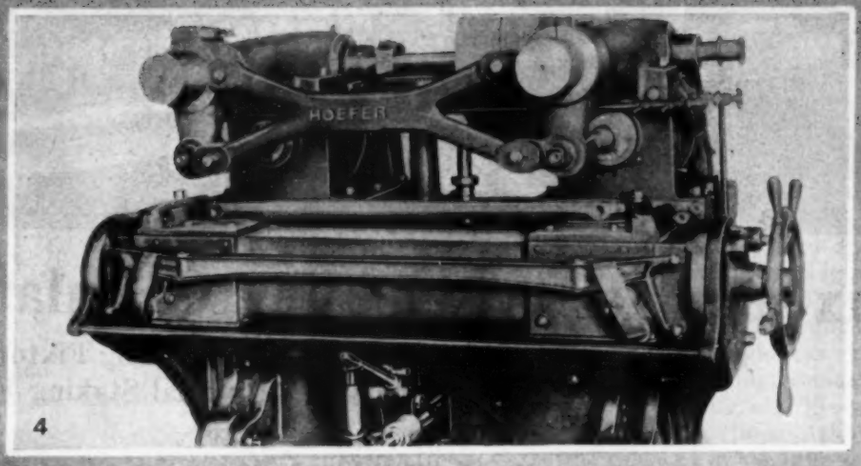


Fig. 5—A double-spindle Colburn heavy-duty drilling machine drilling and reaming steering knuckles. The knuckles are held in spring-controlled drilling fixtures which allow of easy handling, as it is only necessary to raise the upper bar, remove the drilled piece and put a new one in place. Hole is ¾ in. by 5 in. deep. Production 24 per hour.

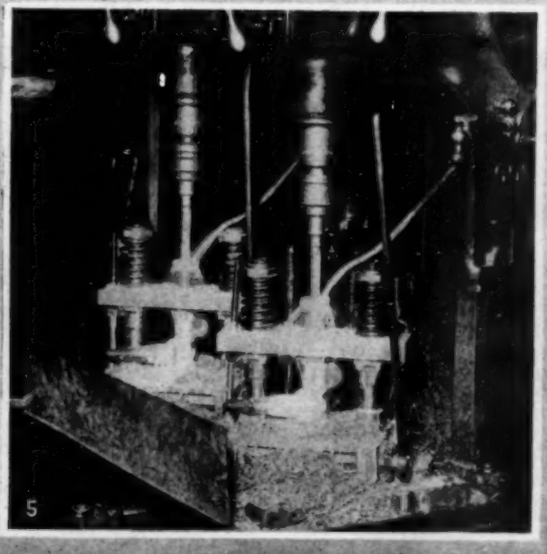
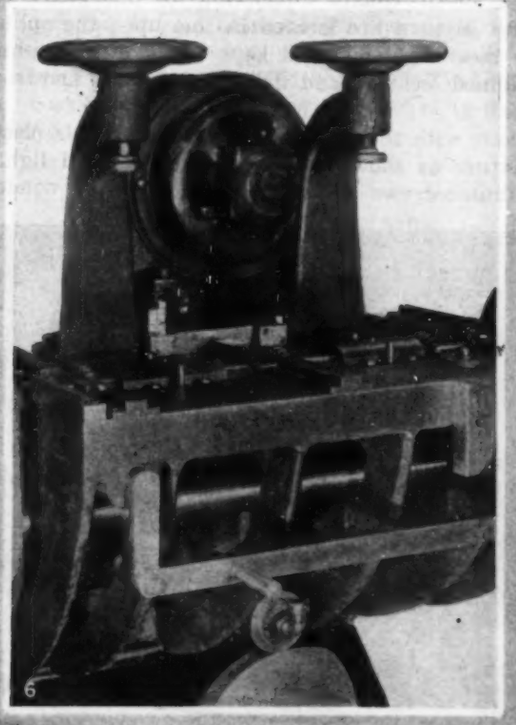
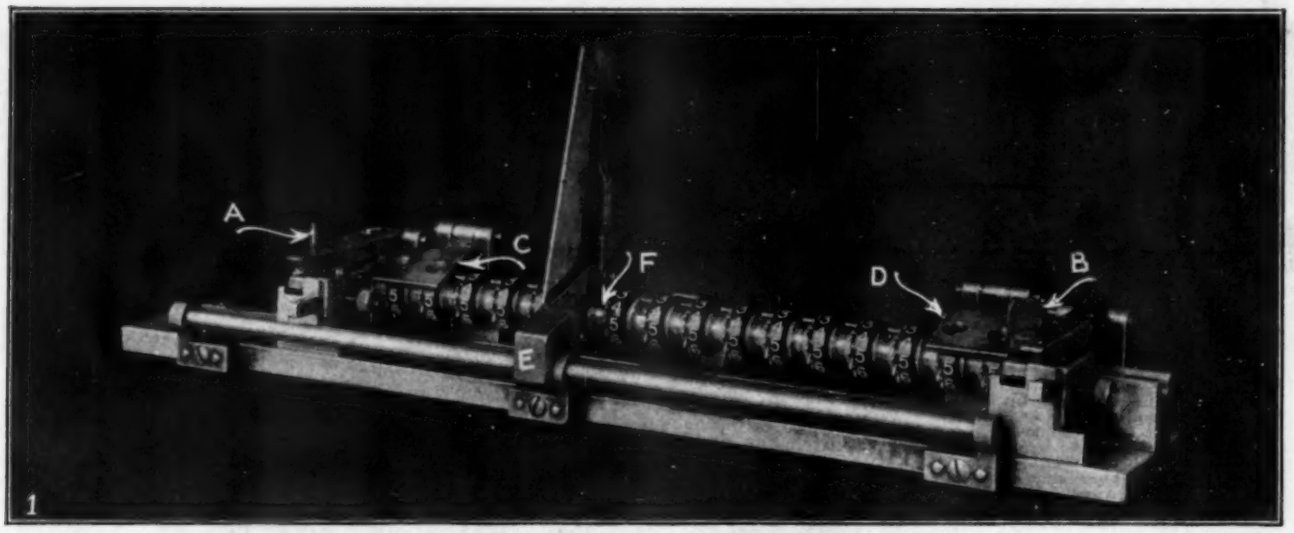


Fig. 6—Another Newton milling machine with a long, horizontal spindle carrying cutters for facing the ends of crankshaft bearings in a motor block.





Fixtures for Assembling Calculator Wheels

A Combined Assembling, Testing and Drilling Fixture That Is Convenient and Efficient—An Unusual Staking Fixture

BY FRED H. COLVIN
Editor, *American Machinist*

THE Monroe Calculating Machine Co., Orange, N. J., has some very interesting methods of assembling its machine. Among them is one for locating the numbered wheels properly on the shaft that carries them. The dial wheels are positioned by means of hardened steel plungers which locate in depressions in the gears. The plungers are controlled in holes in the flanges of the collars supporting the dial gears and the collars in turn are located in line upon the spline-shaft by means of embossed keys which fit the spline. The combined locating and drilling fixture is shown in Figs. 1 and 2.

The shaft with the wheels already mounted, is placed in the fixture as shown in Fig. 1, and clamped lightly by the thumbscrews *A* and *B*. The sight or window gages *C* and *D* are then swung down and the shaft turned until No. 3 shows in each window. To insure the setting, the gage *E* is put in place on the fixture and the forked, lower end of the pointer, placed over the pin shown at *F*. When this is correct the upper end of the pointer must be between the limit lines shown. The shaft carrying the dial wheels is then clamped tightly, the gage removed, and the shaft is ready for drilling. The fixture is then placed on the table of a multiple-spindle drilling machine.

Only two holes are drilled, one in each end, for the gears which actuate the numbered wheel shaft. The same fixture acts as a drilling jig, utilizing the two end pieces as *A* and *B* in Fig. 2. These end pieces swing down over the shaft and contain bushings to guide the

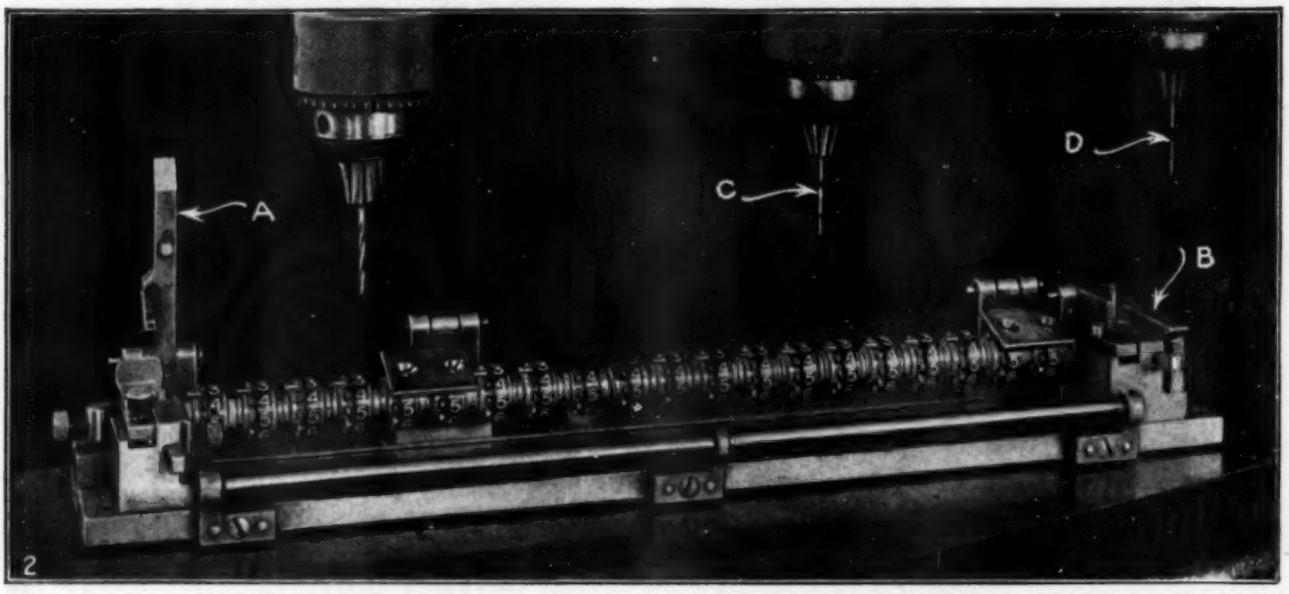


FIG. 1—TESTING LOCATION OF PINS. FIG. 2—DRILLING AND REAMING PIN HOLES

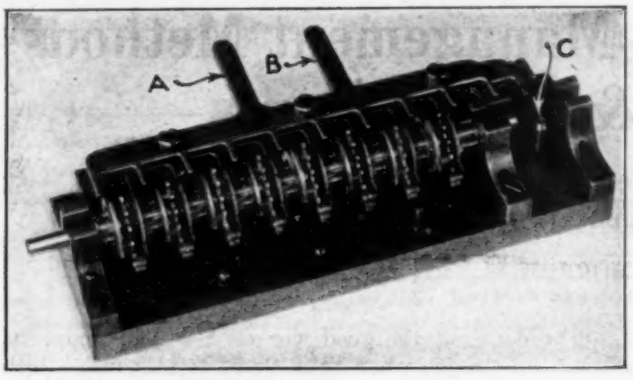


FIG. 3—FIXTURE FOR STAKING PINS

drills. The holes are afterwards reamed for a taper pin, the reamers being shown at *C* and *D*.

Another interesting assembling fixture is shown in Fig. 3 and is for staking the pins in one of the wheel shafts used in the calculator. The wheels are held in position by light springs and in order to stake the pins readily it is easier to hold the wheels apart. To do this easily the shaft is placed in the fixture shown when, by grasping the two handles *A* and *B*, the forks which fit in between the wheels, separate them while the staking is being done.

Beneath each pin is a steel post with a cup or center in the upper end. The pins rest in these cups so that the blow of the staking hammer is taken by the pin and not by the shaft. One of the staking posts which is used for a longer shaft, is shown at *C*. This fixture enables the work to be handled very quickly and insures a good job.

Quack, Quack!

(Reprinted from *Chemical and Metallurgical Engineering*)

Scarcely a week passes without the receipt of printed matter describing some marvelous liquid or powder which will turn merchant bar into finest tool steel, which will double the mileage of a Cadillac if two drops of the stuff are placed in the carburetor, which will convert the purchasable variety of grape juice into extra dry champagne over night, or which will cure warts, corns, sprains, abrasions, cancer and falling hair. Later in the fall we expect to get some more literature advocating the use of some other stuff, "the result of extensive and exhaustive research, experiments, tests and demonstrations by scientists," which will make the mixture of slate and culm to be sold this winter burn like the cleanest anthracite.

That all of these varieties of "Nulife" are sold in large quantity is sure: so many new ones are constantly appearing. And doubtless they are often sold to men who pride themselves with knowing something about their business. A fair share of the purchasers must also be those who have never been victimized before and who must learn from experience, and in no other way, that there is no virtue in nostrums. Furthermore, it is a standing demonstration of the salesman's premise that it is more important to know the psychology of the buyer than anything about his real needs or the nature of the article offered for sale.

Chemical analysis would in most cases show that the largest portion of "Nulife"—and we offer our apology if this pet word meaning all kinds of quack remedies has been previously appropriated—might be water, sand, charcoal, fuel oil or some such cheap ingredient. But not everybody has the opportunity nor the desire for analyzing "Nulife" and finding out whether he could not make it up for himself for about one-tenth the selling price of the "secret composition." Those who have such opportunities ordinarily have wholesome respect for law, and become instantly suspicious of lurid claims, knowing that in the struggle with Mother Nature you can't get something for nothing.

But it would be just as well to spead the word about. There now seems to be a flood of substances on the market by which "wrought iron or bessemer steel of low grade is converted into the equivalent of costly crucible steel as far as physical properties are concerned." A rule-of-thumb or thoughtless heat-treater might easily believe it, remembering the changes he can make in a piece of really high-grade steel by heating and cooling. But he must be warned by more intelligent friends that the metal he has in hand did not appear by merely waving a wand and muttering cabalistic words. It is the result of most extreme care on the part of a hundred men throughout a dozen difficult operations, from the selection of ore and raw materials through steel making, casting, rolling, annealing and inspection. If he will think a little he will agree that all this infinite care, wrapped up in a little piece of flawless metal, cannot be replaced by daubing some dope on some junk and following the printed directions.

Thirty years ago the late Dr. Henry M. Howe was encountering these same ideas, and what he said is very much to the point: "You cannot make a bad beefsteak good by the cooking; you can cook it better or worse, and it will be worse or less bad beefsteak, but always bad. On the other hand, you can easily spoil a good beefsteak by bad cooking. Now, just as cooking is to food, so is heat-treatment to steel."

When you dine at Lung Tong's chop house in Juarez, you use a liberal amount of chili sauce and red pepper, and for a very good reason; but at the Waldorf you do not need to drown one of Oscar's patties in mustard to make it tasty.

Broaching Wristpins

BY GEORGE E. HODGES

On high-grade automotive work, the wristpin is so heat-treated that there is a hard wearing surface on the outside, but the hole is left soft to give the pin added strength.

One of the best methods of accomplishing this, the writer has noticed, is the following: The pins are made of seamless tubing, the first operation being cutting off to length. The pins are then carbonized and allowed to cool in the carbonizing material. The next operation is to broach the holes to remove the case, after which the pins are hardened and ground.

The advantage of broaching seems to be twofold. First, the case is removed in good productive time with consequent low labor, tool and machine cost; second, the pins are very readily sorted to close limits in weight, the only variable being errors in the outside diameter and length.

Some plants broach the hole a second time after hardening, this being for finish only. The second broaching is not generally considered necessary.

Application of Bedaux Management Methods in the Robbins & Myers Plants

Concluding Part of the Article—Time Studies—Premium for Inspection—The Reward of Salvage and Supervision—Reports and Graphs

By L. C. MORROW
Managing Editor, *American Machinist*

UPON completing the examination of the principal records and forms used, that is to say, with the routine of production, the method of making time studies is taken up. We recall the Bedaux laws and the relaxation curve upon which standards are intended to be based and remember that the limits for relaxation time in proportion to working time are 15 per cent and 210 per cent. It is surprising to learn that the relaxation curve is not generally used at this time in the Robbins & Myers plant. However the reason for not using it is enlightening. When the plant was changed from its preceding methods to Bedaux methods, the curve was used for all operations, time studies serving to check the predetermined values. Once the system was in operation, a short cut became possible. The members of the standards department who take the time studies became so well acquainted with the work of the operators they were accustomed to time, that they were able to class them by the amount of accomplishment above 60 Bs, such as 70 or 80 or 90 B operators and knew that the standard of 60 Bs must be set accordingly. The result is that what might be considered very ordinary time-studies are taken. If a 90 B man requires 60 min. for an operation, the standard time on that operation is set at 90 min. The requirements of that operator and of any other operator on that job are 60 Bs. For the extra 30 Bs that the 90 B operator produces he is rewarded.

Why does not the good worker, the 90 B man, "lay down" on the job when he is timed to influence a lower standard and make possible either easier work for himself or higher reward for the better work that he knows he can do after the rate is set? There is little doubt but that he would if he did not have that "confidence in management" previously mentioned. By experience he knows that the standard will be set right. He feels also the confidence placed in him by management in selecting him to study. And he knows that the other workers in the department are satisfied with him as their time-study representative and do not expect him to run any risk of lessening the co-operation that exists.

We are told that such statements as have just been made are not expressions of theory, but that they represent experimental facts. Having observed that there is also confidence of management in man we ask if it extends so far as to allow the operator to choose his own method of working. The answer is that no opportunity is lost to reduce strain by altering the sequence of motion, arranging for better positions of the body, and in similar ways and that the engineering department is in no way limited in improving method and equipment.

Attention is turned next to inspection. We are especially anxious to know just how inspection is carried on as premium work and how the amount to be paid

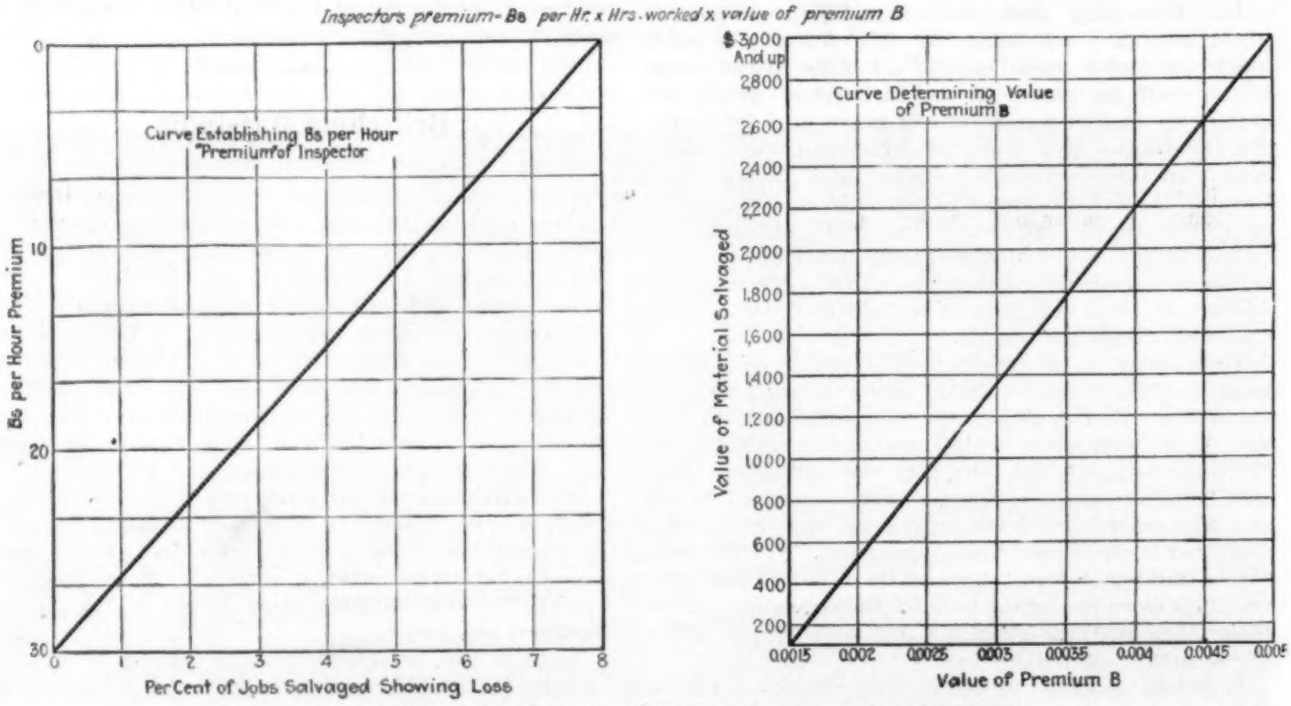


FIG. 10—CURVES ESTABLISHING PREMIUM OF SALVAGE INSPECTORS

Form 736

SUPERINTENDENT'S WEEKLY SUMMARY

Dept. Class of Work

Week Ending 19 B-Hr. Previous Month

Normal % Capacity Loss

Labor Cost Per B
Actual Overhead Cost B
O. H. Cost B Pro-Rated
Total Cost Per B

										TOTAL
1	Productive	Date								
		Ave. B-Hr.								
		Hours								
		TOTAL Bs								
2		Mach. Capacity @ N. M.								
3		Percent of Loss								
4		No. Operators Below Standard								
5	Distribution Prod. Bs	Standard								
6		K-16 Inspection N. T. O.								
7		K-17 Prod. D. W.								
8		K-22 Set Up								
9	Non-Productive Bs Allowed Productive Operators	K-03 Miscellaneous								
10		K-06 Inspection								
11		K-08 No Power								
12		K-13 Trucking								
13		K-20 Wait on Work								
14		K-21 Below Standard								
15		K-26 Repair Machines								
16		K-58 Non-Durable Tools								
17		K-62 Rework								
18		K-64 Labor on Free Material								
19										
20										
21		TOTAL								
22	Non-Prod.	Hours								
		Bs								
		No. of Men								
23		Scrap								

FIG. 11—WEEKLY SUMMARY FORM

is determined. The explanation is that a specified amount is paid for each piece inspected and that an additional amount is paid for each piece rejected. In other words, each reject carries a reward as an incentive to careful inspection. The amounts vary from 50 to 500 per cent. Incidentally it is learned that the cost of inspection is not over 1½ per cent of the shop costs, which include the costs of productive labor, all factory burden (including fixed charges such as taxes, insurance and depreciation), and material, both productive and non-productive, that is put into operation each month; that the expense for scrap is less than one per cent of the total expense of factory operation; and that over a period of two years the scrap percentage was reduced by 50 per cent.

The steps taken in placing inspection on premium are as follows: (a) Determine the percentage of inspection required; (b) take time studies; (c) set the standards and post them on the inspection operation reference cards; (d) send out an inspections standards notification letter.

A very efficient check on the inspection department is furnished by the salvage department to which all scrap is sent. The scrapping of good pieces either by intent or accident would be noticed. Workers in the salvage department are paid a base rate or salary and an award depending upon the amount saved in dollars. The department has the privilege of making out rework tickets, using a special form that takes care of crediting the factory with the saving made. Production cost is reduced, without addition to the operator's earnings.

There must be some way to control the work of the salvage department to prevent the making of rework recommendations that would prove to be failures and to insure that reworking be recommended wherever possible and practicable. What has been done toward control and payment of salvage accomplishment is indicated in the charts, Fig. 10. There are two factors controlling the premium paid, the percentage of jobs salvaged that show a loss, and the value of the material salvaged. If the percentage of jobs salvaged that show a loss is 8 or over no premium is paid. If the percentage is under 8, a premium is paid, the B value per hour being determined from the left-hand chart. The second step is to find the value of the premium B for the value of the material salvaged from the right-hand chart. The two values found are used in the formula:

$$\text{Salvage inspector's premium} = \text{Bs per hour} \times \text{hours worked} \times \text{value of premium B}$$

For example, salvage inspector Smith salvaged during a pay period of 220 hours, 100 jobs, of which 4, or 4 per cent, upon being reworked, showed a loss. The value of the material salvaged in the ninety-six jobs was $2,600. From the left-hand chart we find that Smith was entitled to a premium of 15 Bs per hour. From the right-hand chart we find that the value of a B was $0.0045. Substituting in the formula,

$$\text{Smith's premium} = 15 \times 220 \times \$0.0045 = \$14.85$$

Had none of his jobs shown a loss and the value of the material salvaged remained constant, he would have received

$$30 \times 220 \times \$0.0045 = \$29.70$$

But it is almost certain that the value of the material salvaged would have increased. Had it gone to $3,000 or more the premium would have been $33.

Knowledge of the Bedaux system has induced a desire to see the people at work under it and a trip through the shops is taken. The impression upon entering the machine shop is that it has the appearance of any well-laid-out and efficiently conducted shop. Nor is that impression changed, except in two ways. There is perhaps less material piled around the machines than in the average shop, and there seems to be no visiting among employees. At the same time there are no wild-eyed operators such as may be seen in some piece-work shops, acting as if they were manufacturing money all of which is to be their own. The absence of lost motion is apparent, however, and the closer the observation the greater the conviction that the operators know their own measure and are living up to it, without unduly taxing their strength. The payrolls, previously examined, show that these people are not being underpaid.

The tour includes other departments, which furnish no cause for additional notes and finally brings us to the winding room, where it seems that the work is being done noticeably faster than in other departments. The impression proves to be true. The plant is passing through a business depression and only the best operators have been retained. The interesting fact is brought out that when the plant is running full time there are four classes of winding operators, A, B, C and D. Their hourly rates run say, 36, 30, 27 and 24 cents. But their standards also vary, so that while the Class A operator must do better than 60 Bs per hour to earn a premium, or reward, the Class B operator need do only 50 Bs, the Class C operator 45 Bs and the Class D operator 40 Bs as standards, reward being paid for additional Bs. Class D operators are advanced to Class C as soon as they can hold their own in that class, then to Class B and finally to Class A. The possibilities in this variation of straight B payment are apparent and to be told that it is highly effective causes no surprise.

There is pointed out a job of winding small armatures on which production was increased from 30 to 40 per day. That was during the early months of the installation of the system and the hardest part of that job was to convince the operators that the B value was guaranteed.

Details on a punch scrap baling job are given. Before placing premium on the work, it was thought that a second baling machine would have to be bought. Five men were baling 7½ tons a day but not collecting the scrap or delivering the bales. With premium on the job, the force was reduced from five to three, then increased to five when the operation of gathering the scrap was added, then reduced to three, where it remained. The three now on the job collect and bale

PLANT MONTHLY SUMMARY SHEET

PLANT _____ PAY ROLL SUMMARY

MONTH OF _____ B-HOUR LAST MONTH

Prod. Cost per B
Non-Prod. Cost per B
Normal Ratio Non-Prod. Cost to Prod. Cost
Actual " " " " " "
Total Cost per B
Total Cost Last Month

							TOTAL
PRODUCTIVE	Week Ending						
	B-HOUR						
	Hours						
	Total Bs						
	Mach. Cap'ty @ M.M.						
	Percent of Loss						
	No. Opers. Below Stand.						
DIST. PROD. Bs	Standard						
	K-16 Inspection N.T.O.						
	K-17 Prod. D.W.						
	K-22 Set-up						
NON-PRODUCTIVE Bs ALLOWED PRODUCTIVE OPERS.	K-02 Miscellaneous						
	K-05 Inspection						
	K-08 No Power						
	K-13 Trucking						
	K-20 Wait on Work						
	K-21 Below Standard						
	K-26 Repair Machine						
	K-58 Non Durable Tools						
	K-62 Rework						
	K-64 Labor on Free Material						
	TOTAL						
NON PROD.	Bs						
	Hours						
RATIOS	Normal- Allowed to Prod. Bs	1-	1-	1-	1-	1-	1-
	Actual- " " " "	1-	1-	1-	1-	1-	1-
	Normal- Non-Prod " " "	1-	1-	1-	1-	1-	1-
	Actual- " " " " "	1-	1-	1-	1-	1-	1-
	Normal- K-16 " " "	1-	1-	1-	1-	1-	1-
	Actual- K-16 " " "	1-	1-	1-	1-	1-	1-
	Normal- K-17 " " "	1-	1-	1-	1-	1-	1-
	Actual- K-17 " " "	1-	1-	1-	1-	1-	1-
	Normal- K-22 " " "	1-	1-	1-	1-	1-	1-
	Actual- K-22 " " "	1-	1-	1-	1-	1-	1-

Form 147-S

FIG. 12—PLANT MONTHLY SUMMARY FORM

the scrap and haul out the bales. The production is 15 tons per day. There has been no second machine purchased. Asking if the two jobs just described are not "show" jobs invokes the reply that while they are among the best, they are not exceptional.

During the trip through the plant the foremen had shown that they are satisfied with, even proud of their system and the results it is accomplishing. Upon returning to the office we are shown a formula that time and experience have proved to be correct in determining the reward for supervisors and indirect labor. The four factors affecting the computation are:

(1) That part of the cost of the B for which supervision (or indirect labor) is directly responsible.
(2) The theoretical ratings of those participating (*e.g.* foremen of 1st class, foremen of 2nd class, assistant foremen, truckers, job setters, etc.).
(3) The actual accumulation of premium in the pool (money value of 25 per cent of the production above 60 Bs, the 75 per cent having been paid to the operators).
(4) The theoretical rating of the individual participating.

Premium for supervision or indirect labor as well as direct labor is paid by separate check so that it is never confused with the regular salary check.

Reports That Tell the Story

With the examination of plant routine and operation concluded, the next step is a consideration of the several ways in which management follows the progress of the work and knows at all times the costs for both good and scrap parts. It is probably the most interesting phase of the application of the Bedaux system, because ordinarily in many cases cost reports are post mortems —they are too late to benefit the patient, profit.

The only known way to hand cost data to executives is by means of reports. The Bedaux system offers no other method, its principal reports being:

(1) The daily report of operators below standard.
(2) The daily report of the B-hour averages by departments.
(3) The daily scrap tickets.
(4) The weekly scrap report.
(5) The weekly summary by departments.
(6) The monthly summary by departments.
(7) The plant monthly summary sheet.

The function of the daily report of operators below standard is to acquaint the management and foremen with the weak spots in the day's work. The cause for operators being below standard is investigated daily to determine if it is due to incompetency, operator misplaced, lack of knowledge on the part of the operator, or if some adjustment of machines or tools is necessary to meet the daily requirements. Experience has indicated that in the majority of cases where operators are below standard, it was due to some cause beyond the control of the operator. The daily report gives the foremen and superintendents opportunity to correct such conditions daily, if necessary. The form of report is simple and on that account no cut is given.

No illustration of the form used for the daily report of the B-hour average by departments is given, because it likewise is simple, furnishing merely figures showing the Bs for each department and the B-hour values. As there must be a cause for variation from day to day in total Bs and B-hour values, the usefulness of the report is apparent. Ordinarily, it is much easier to locate the cause of a department's falling behind than it is to learn the fact that it is falling behind.

Daily and weekly scrap reports enable precautionary measures to be taken and leaks to be stopped without delay. The daily report invites immediate action, the weekly report prevents unjust action. Likewise an unusual amount of scrap on a weekly report may be found to be justified when the month as a whole is considered.

In Fig. 11 is shown the weekly summary form for one department. Beside its value on account of the information shown, which needs no further explanation, it has a value for later use in making up the plant monthly summary sheets. There are two kinds of monthly summary reports—by department and by plant. The department report is similar to the weekly summary report, although more complete. No example is shown.

The plant monthly summary form is shown in Fig. 12. Careful study of this form will show that it points out in actual figures, and compares with similar figures of the previous month, just those things that it is necessary for management to know. Especial prominence is given to K orders, or non-productive work, as it is on them particularly that profit may be lost.

It is always difficult to compare figures and obtain from them the quickest and best conception of the trend an activity is taking. Like almost all modern concerns engaged in business the Robbins & Myers Co. resorts to the use of graphs. There are four principal ones outlined below. The sources of their information have been described. It is fitting that they hang in the office of the production control manager.

Graph No. 1—Manufacturing Results

This graph reflects the trend of seven factors of the manufacturing division and is made up monthly by plants, a separate graph being made for each plant.

The seven factors are as follows:

(1) Productive operators.
(2) Productive Bs produced.
(3) Cost per B (total labor and manufacturing burden).
(4) Allowed Bs (non-productive Bs produced by productive operators).
(5) Non-productive operators (indirect labor such as foremen, assistant foremen, clerks, repair men, etc.).
(6) B-hour average (average productive Bs produced hourly per man). This figure compares with a thermometer in that it reflects the "temperature" or efficiency of the various departments or the plant as a whole.
(7) Scrap Bs. (This item reflects volume of Bs scrapped by inspection, prior to delivery to the salvage department.)

Graph No. 2—Planning and Material

A graph that consists of seven curves listed below and offers a very efficient method of controlling inventory:

(1) Raw material on hand
(2) Manufactured parts in stock.
(3) Work in process.
(4) Finished motors in stock.
(5) Finished fans in stock.

(6) Branch and consigned stocks (fans and motors).
(7) Purchased tools and shop supplies on hand.

GRAPH NO. 3—LOAD CHART

The following three very important features are shown:

(1) Capacity of plant (shown in Bs computed monthly according to the number of working hours or days in the month).
(2) Sales schedule (reduced to Bs).
(3) Actual production (in Bs).

These curves reflect instantly the gap between the capacity of the plant and sales schedule; also, whether actual production is meeting or exceeding the sales schedule. In a case of the latter, it indicates that parts are being manufactured for stock in excess of sales requirements.

GRAPH NO. 4—INSPECTION GRAPH

A graph that reflects eight factors concerning the inspection department as a whole. All of these curves show money values:

(1) Value of scrap less salvage.
(2) Payroll of inspection department.
(3) Per cent of value of work scrapped in relation to shop cost.
(4) Cost of operating the salvage department.
(5) Savings of salvage department.
(6) Total value of scrap.
(7) Shop cost. (This item covers complete cost of manufacture.)
(8) Free repair cost to customers. (All service cost to customers within guaranteed time limit of company's product.)

High-Speed Rotating Machines

Developed for Testing the Burning Action of Powder Rings in Shell Fuses Under Normal Conditions—Special Chronograph for Recording Elapsed Time

BY H. M. BRAYTON

THE literature pertaining to mechanics and mechanical engineering has during recent years contained many articles on high-speed rotation. It is not the purpose or intent of the writer to develop new theories of balance of rotating parts or to attempt to add to the already well developed science of dynamic balance. It is rather the purpose here to tell the reader what has actually been accomplished along this line by the Army Ordnance Department under the pressure of necessity. No attempt will be made to explain the results obtained. The mathematical treatment will be left for those better qualified, should they be interested.

It is necessary to rotate an artillery projectile at a high speed in order to make it stable and so that it will carry properly in flight. This rotational speed varies widely in the various calibers covering a range from 4,000 r.p.m. in some of the large guns and howitzer to over 38,000 in some of the smaller howitzers. The usual speed, however, is around 17,000 r.p.m. and is accomplished by the rifling in the bore of the gun.

In the development of new types of fuses to meet the needs of the service, it became necessary to study the action of certain moving parts within the fuse that were operated upon by the centrifugal force created by the rotation. It is true that these forces can be calculated with mathematical exactness but it was soon found that the fuse did not perform as it was calculated to do and a more practical method of studying the action was at once needed.

Under the law of necessity the Ordance Department began an intensive study of rotating machines and the best experts were called in for advice. It was desired to rotate a 1½-lb. fuse at 17,000 r.p.m., but some of the experts said it could not be done. Others believed it could be done by the installation of the necessary elaborate apparatus which was to cost $6,000 and take up about 200 sq.ft. of floor space.

This price was of course excessive but the department was in urgent need of a rotating machine for carrying on experimental work and a decision had about been reached to place a contract for the $6,000 apparatus when a dark horse entered the field. This dark horse appeared in the form of a gentleman who had probably never heard that such high speeds are not practical. He was not an engineer or scientist but he had heard that we wanted a high-speed rotating machine and claimed to have produced it. In other words he carried out the well known motto "He didn't know it could not be done so he went ahead and did it." At any rate a demonstration proved his statements to be correct and his machine would actually run at 20,000 r.p.m. Needless to say the machine was purchased at a price very much under $6,000, and the floor space required for installation of the machine was negligible.

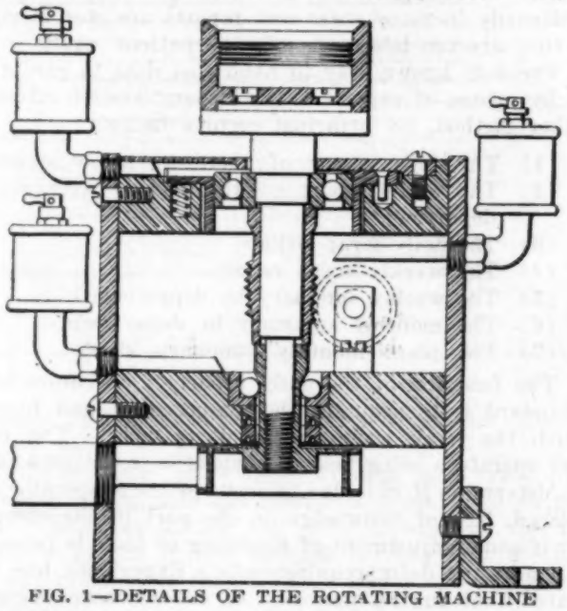


FIG. 1—DETAILS OF THE ROTATING MACHINE

The rotating machine itself is very simple. A sectional view of the assembly is shown in Fig. 1. The machine has a vertical spindle mounted in ball bearings of the usual form. The bottom bearing is a regular thrust ball bearing. The top bearing is mounted in a plate supported on eight small coil springs. This plate

is made with considerable side play in the head. In other words the shaft is not held rigidly and therein probably lies the secret of the success of this machine. The shaft is permitted side play and will thus find its own center. It may vibrate considerably while passing through the critical speeds but it will always smooth out as it goes higher.

The whole interior is mounted as shown in a circular steel shell, and the bearings are lubricated with very thin oil by means of ordinary oil cups. At the bottom of the shaft is mounted a fan designed to operate on air pressure of about 75 lb. On the center of the shaft a worm is cut into which a wheel meshes. A side shaft runs out through the casing of the machine and is arranged to take a speed counter. The speed read on the counter must be multiplied by 25 to get the speed of the shaft which carries the fuse.

At the top of the vertical spindle any special fixture or holder may be mounted to take the fuse which is to be rotated. The more weight put on the shaft the less the speed obtained. It is an actual fact, however, that a speed of 50,000 r.p.m. has been obtained with this machine with a weight of 1½ lb. at the top. With nothing but the bare shaft a speed of 74,000 r.p.m. has been obtained. The values appear to be very excessive to those who are familiar with high-speed rotating devices but they have actually been obtained and what is more these facts can be proved at either the Frankford Arsenal, Philadelphia, Pa., or the Picatinny Arsenal, Dover, N. J., where the machines are installed.

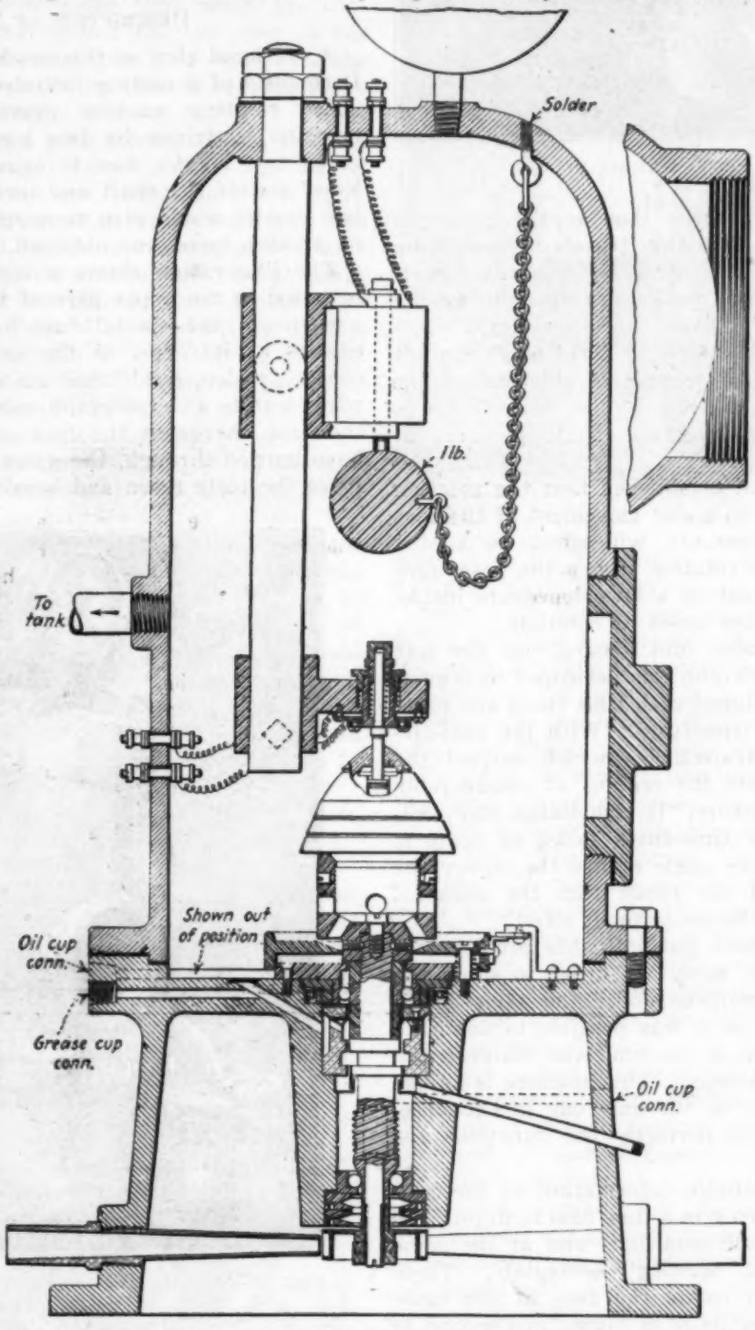


FIG. 2—DETAILS OF MACHINE FOR TESTING BURNING TIME OF FUSES

The design shown here has been modified considerably from the one first made. As previously stated the first machine would give 20,000 r.p.m., but it was found possible by certain changes to greatly increase this speed and at the same time greatly increase the life of the machine.

The reader who is familiar with such machines will at once think that such a speed would very quickly wear out the bearings and shaft. Such is not the case however as one machine at the Frankford Arsenal has been in constant use in experimental work for over a year and still appears to be as good as ever. One of the leading makers of ball bearings stated officially that no ball bearings could be made to stand such speeds. They do stand it and are giving perfect service to the Ordnance Department. Higher air pressure for driving the shaft than 75 lb. has not been tried, due to lack of facilities for obtaining higher pressures where the machines are now installed. The air used must be passed through a separator and all water removed, as any water will choke the rotor and at once reduce the speed. The machine is mounted on a table or bench and a hole is cut under it for the air to pass through after it has done its work on the rotor. Needless to say this machine has been of invaluable assistance in the development of artillery fuses. With it we can study the action of any projectile mechansim under the actual forces which it receives in flight and we are able to reach higher speeds than any gun in our service gives to its projectile. The powder ring time fuse was used almost exclusively during the late war wherever a time fuse was needed. These fuses were quite satisfactory for use in artillery as employed before the advent of the airplane. High trajectories were not common except in certain mortar firing in seacoast artillery work.

It has been a well-known fact for years that the powder ring in a time fuse burns at different rates at different pressures, that is, at different atmospheric pressures or gas pressure of the surrounding medium. To be more specific it was well known that as the air pressure surrounding the burning fuse was increased, the time of burning of the fuse was decreased and vice

FIG. 3—THE ROTATING MACHINE

versa. This means of course that as the projectile which carries a powder time fuse travels upward from the earth's surface into the rarer air it burns slower. With flat trajectories the results are opposite as the fuse would burn faster. Such fuses are timed statically on the bench and if a time in flight of 21 seconds is desired, a time of 22.5 seconds is obtained on the bench. This reduction of time in flat trajectories is probably due to the building up of air pressure at the nose of the shell.

Again it has been well established that the rotation of the shell itself, with no linear movement of the fuse or change of exterior pressure, will affect the timing of a powder fuse. The rotation makes the fuse burn slower apparently by creating a lower pressure inside. This effect varies with the speed of rotation.

When the airplane came into general use for war purposes the anti-aircraft gun was developed to combat it. All shrapnel are equipped with time fuses and practically all with powder time-fuses. With the anti-aircraft gun came high trajectories which carried the shrapnel and fuse up into the regions of considerably reduced atmospheric pressure. In compliance with well-known laws the powder time-fuses failed to perform properly. The higher the angle of fire the slower the fuses would burn with the result that the shrapnel would burst beyond the target without effect.

Intensive study has been put into this problem but much still remains to be done. In order to study the behavior of powder time-fuses under the same conditions of flight, as near as it was possible to duplicate them, a special apparatus or machine was designed and built at the Frankford Arsenal. This machine is unique because it is believed to be the only one in existence. Furthermore it performs perfectly the functions for which it is designed.

In order to obtain definite information on the rate of burning of a powder ring in a time fuse in flight, it is necessary to duplicate all conditions and at the same time take the "time of burning" accurately. These conditions are first; to rotate the fuse at the same speed as when the projectile is in flight; and second to establish a pressure around the fuse equal to that obtained in flight. In other words a machine has been designed and built by which it is possible to take the time of burning of a powder time-fuse while being rotated at the same speed as when the projectile is in flight and while surrounded by air pressure or partial vacuum equal to that in flight. Of course the air pressure varies throughout the trajectory and we have to run tests at definite pressures for each increment of travel. These pressures at different altitudes are quite well known. Tests at different rotational speeds are needed only to study the effect in different guns, as a projectile in flight slows down but very little throughout its travel. This statement does not apply to gas shells in which the rotational speed is considerably reduced. This reduction in speed is due to the liquid inside of the shell acting like a brake trying to catch up to the speed of the shell.

Description of Machine

A sectional view of this machine is shown in Fig. 2. It consists of a casting mounted over the regular high speed rotating machine previously described. This machine is driven by two air nozzles. The idea in using two nozzles was to equalize the thrust on the lower end of the shaft and incidentally to learn if the two nozzles would give more speed. It was found that no greater speed was obtained.

The illustration shows a regular powder time fuse mounted in the upper part of the vertical shaft. Just underneath the special fuse holder is a plate which carries at its edge, at the extreme right, a bracket contact which establishes an electric circuit. These wires lead to a chronograph outside the machine. When the base charge in the fuse explodes after the rings have burned through, the gases from the black powder force the plate down and break the electric connection

FIG. 4—MACHINE FOR TESTING BURNING TIME OF FUSES

at the right. The breaking of this circuit is recorded on the paper of the chronograph and thus registers the time when the fuse finished burning.

From the top of the casting a large steel rod hangs vertically downward. This rod carries an adjustable bracket which is part of an electromagnet. Wires lead from this magnet outside the casting through two binding posts. The magnet holds up a steel ball the dropping of which functions the fuse as follows:

At the lower end of the vertical steel rod is another bracket used to support a firing pin and another breaker mechanism. The ball is dropped by opening the magnet circuit and strikes the top of the firing pin driving it down and firing the concussion primer of the fuse. At the same time it breaks the circuit incorporated in this mechanism. This circuit is connected to the same chronograph as the circuit at the base of the fuse. This upper circuit registers the time when the concussion primer fired and ignited the top ring of the fuse. The distance between these two marks on the chronograph is a measure of the time in seconds taken by the fuse to burn through.

The casting is arranged with a hand hole in the side through which a fuse may be placed in the holder. Both brackets on the rod are adjustable for height, thus making it possible to test any time fuse, and also to drop the ball upon it from any reasonable height.

This machine is arranged for either internal pressure or vacuum. If pressure is required it is fed in through a pipe line at the left from a tank which in turn is supplied from a pump. The tank is interposed between the pump and machine to reduce pulsations. Similarly we can obtain vacuum inside the case by pumping out the air. As this machine is now installed it is possible to obtain either 25-lb. pressure or 21 in. of vacuum (less than 5 lb. absolute pressure) with the same small pump. This is done by an arrangement of valves.

It was comparatively easy to make this apparatus air tight to these pressures except for the space around the rotating shaft. Any of the ordinary forms of packing would not do because they would bring so much friction on the shaft that the desired speed could not be obtained. At first it was attempted to obtain an air seal around the shaft by means of oil under pressure. This was not at all satisfactory as the oil would all be thrown out. Due to the high speed desired as in the earlier rotating machine it was necessary to leave considerable clearance around the shaft. This clearance was not conducive to easy sealing against 25 lb. air pressure.

After many difficulties the problem was finally solved by the incorporation of a soft leather washer formed into a cup as shown. This washer caused very little friction on the shaft and did not prevent obtaining the desired high speed. The washer is for use either with pressure or vacuum. With pressure inside, the washer pushes down against the surface underneath and the greater the pressure the greater it will bear. The leakage is very small and easily taken care of by the small pump.

The apparatus in its present form lends itself to rapid manipulation and it is possible to conduct tests quickly. A vent is arranged to carry all the burned gases from the fuse outdoors so that prolonged testing will not injure the operator.

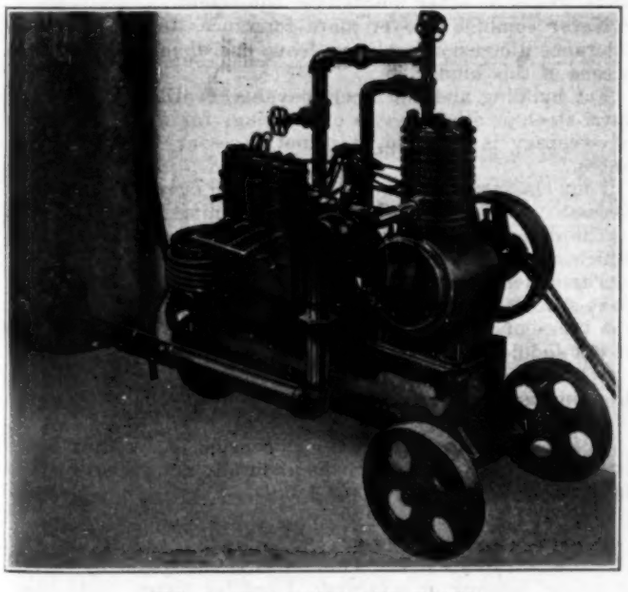


FIG. 5—THE PUMP AND TANK

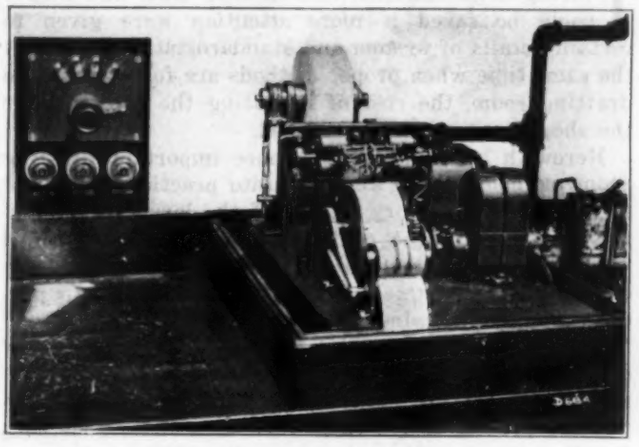


FIG. 6—THE CHRONOGRAPH

Some photographs are also given which show the actual machines discussed in this article. Fig. 3 shows the small machine first described with the safety cap beside it on the bench. It is shown with a time fuse screwed into the head. With this weight it will give a speed of 50,000 revolutions per minute.

A view of the combination machine is shown in Fig. 4. The hand plate that closes the opening through which the fuse is inserted has been removed and is lying on the bench. The tachometer is also to be seen. The air enters through the vertical pipe at the left and the speed is controlled by the valve shown in the front view. The pipe leading to the chamber shown at the rear either conducts air to or from the machine, depending on whether pressure or vacuum is used. The pressure or vacuum is also regulated by a valve plainly shown in both views.

The galvanized iron tank and combination pump used in connection with the machine are shown in Fig. 5. The tank is used to prevent pulsations in the machine itself and to create a reservoir of pressure or vacuum if suddenly needed.

The chronograph, Fig. 6, specifically designed for testing fuses was extensively used during the war. Two records are made on the strip of paper. One records and marks off seconds and the other registers when the fuse started burning and when it finished.

Retaining the Worker's Interest

BY ROBERT GRIMSHAW

Interest of the worker in his work may be retained by the same means used to awaken it, although a trifle more psychology, perhaps, is brought into play. Monetary incentive is not enough. Pride in the quantity and the quality of the work may not merely be awakened, but it may also be kept alive by friendly competition.

Drafting Room Efficiency

Printed Instructions for Draftsmen—Specifications for Kinds of Fits and Finishes—Designating Tolerances — Eliminating Friction Between Draftsmen and Checkers

BY CHARLES SORENTRUE

IN A LARGE number of drafting rooms of manufacturing organizations, considerable time and money could be saved if more attention were given to certain details of system and standardization work. At the same time when proper methods are followed by the drafting room, the cost of executing the drawings by the shop is automatically reduced.

Herewith are some of the more important drafting room methods which were put into practice and found to be very satisfactory by one of the largest manufacturing plants in the country. The methods outlined were adopted primarily to increase the efficiency of the engineering department and at the same time to produce complete drawings at a minimum cost.

One of the first steps taken was to write a book of drafting room instructions, a copy of which was furnished to each draftsman. In this book was incorporated general instructions such as standard methods for dimensioning, the tolerances allowable for different kinds of fits, finishes and symbols used, lists of various stock sizes of material carried in stores, and also photostatic copies of typical drawing of fixtures, gages and so forth.

It is surprising how much more time the drafting room squad leaders had to devote to design supervision after these books were issued. Previously most of their time had been taken up in explaining points covered by these instruction books. In addition to this advantage each squad leader could efficiently supervise from 20 to 25 draftsmen, whereas before he could only supervise from 12 to 15 men.

An assembly sheet and part of a detail sheet for a typical fixture drawing, copies of which were in each instruction book, are shown in Figs. 1 and 2. By referring to these sheets it will be seen that the drafting room furnished complete information to the shop and, by making the detail drawings as shown, a job could be divided among a number of men in the shop by simply cutting out the details along the ruled lines on the print in Fig. 2, the information for each detail being complete in itself. This was often found necessary in order to expedite the work.

Another important point to be noted on the detail sheets is the finish marks f_1, f_2, etc. Upon investigation it was found that parts of fixtures and machines were very often being highly finished by the shop when it was not necessary. This was especially true in cases where the different parts for the same fixture were given to different toolmakers. This unnecessary extra machining was very costly, so the practice was established whereby each surface to be finished was marked f_1, f_2, etc., on the detail drawing according to the kind of finish required. In addition to unnecessary finishes, it was also found that very often the toolmakers were working entirely too close in cases where no tolerances were specified on the drawing, therefore the following was decided upon to remedy this trouble, viz.: a tolerance of $\frac{1}{64}$ in. was allowable for all common fractional dimensions. Allowable tolerances for decimal dimensions were always to be specified. Herewith is a copy of sheet No. 6 from the drafting room instruction book, which explains fully to each draftsman the symbols for finishes and methods of dimensioning drawings. To eliminate any misunderstandings between shop and drafting room, the shop was also furnished with this same information regarding finishes and tolerances.

TOLERANCES AND FINISHES

Express dimensions in common fractions if not essential or where accuracy is not necessary.

Scale is used in shop for common fractional dimensions.

Express dimensions in decimals if essential or where accuracy is necessary.

Micrometer is used in shop for decimal dimensions.

Permissible tolerance should be noted for *each decimal* dimension used in connection with machines, jigs, fixtures, tools, gages or other mechanical equipment.

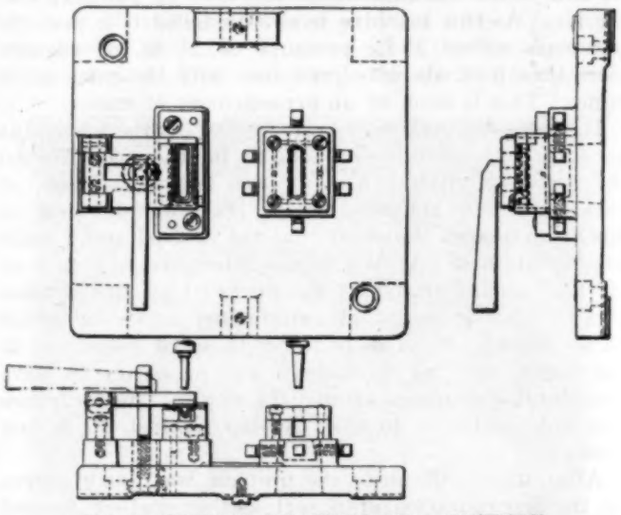


FIG. 1—TYPICAL DRAWING OF A FIXTURE

Never combine two or more tolerances to make a total tolerance dimension. Always leave one dimension blank, in a case of this kind.

For building and machinery layouts, ventilating or structural steel, or other classes of drawings for which no degree of accuracy is required, it is not necessary to note tolerances.

Four classes of fits should be noted on drawings wherever necessary: Drive fit, light drive fit, running fit and slide fit.

The dimension should be given for the hole or part into which the pin or other part fits.

The dimension for the pin or part which fits into another part should also be given; but in addition to the dimension, the class of fit and piece number of the part into which it fits should be noted, thus: Drive fit, No. 2.

When it is necessary for a part to fit close to a model, the dimension is given thus: 0.345 = Mod. ± 0.0005 or 0.625 = Mod. + 0.0005.

It is not necessary to give a dimension of a radius which is shown on a detail, when the radius is not important and is not governed by any other details.

FINISHES

F1—*Polishing Finish:* This finish is obtainable by careful grinding, lapping or scraping. Used for gages, tools, shaft

journals, and other sliding surfaces for the best class of machinery, especially on high speed machines.

F2—*Ordinary Grinding Finish:* This finish is obtained by grinding. Used for surfaces which slide at low velocities with a limited travel; for shafts between bearings; for

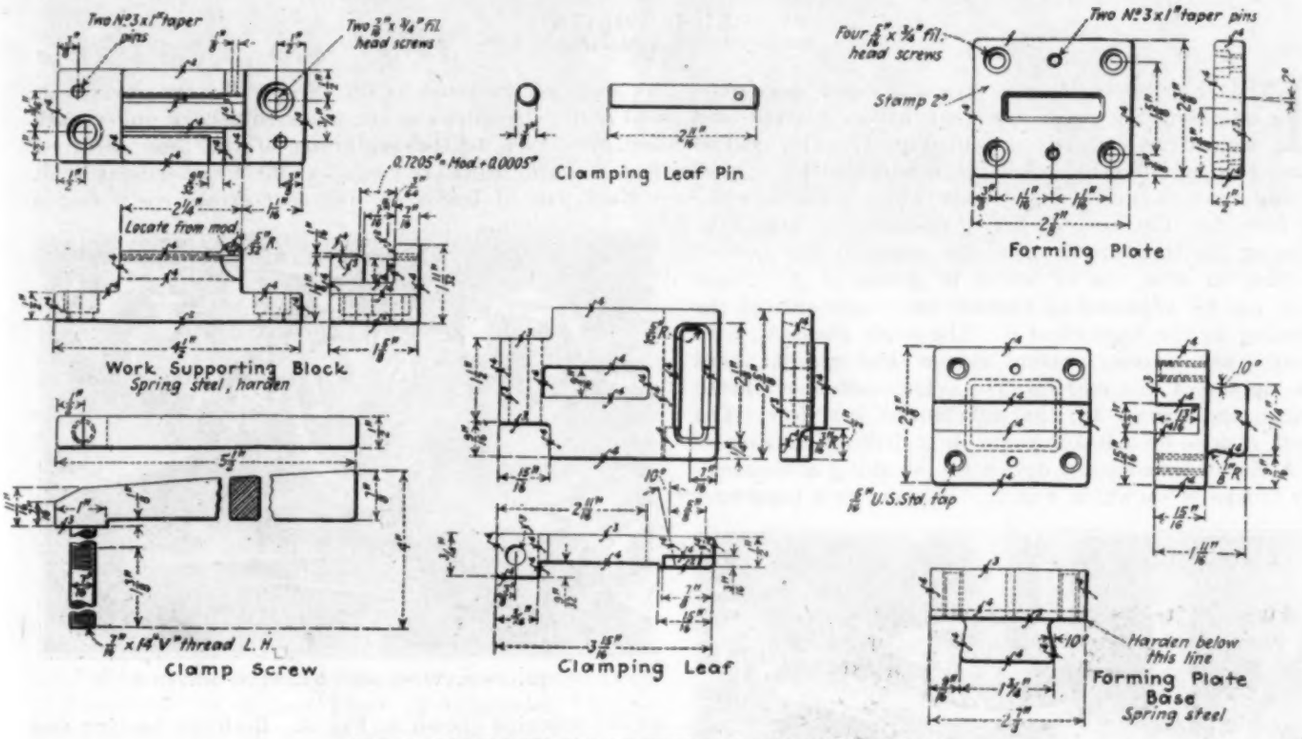


FIG. 2—SOME DETAILS OF FIXTURE SHOWN IN FIG. 1

machine parts which must be kept clean and free from oil, powder, dust, etc.

F3—*Smooth Machine Finish:* This finish is obtained by milling cutters, finishing lathe, or planer tools. Used for surfaces which do not slide, except occasionally, as parts

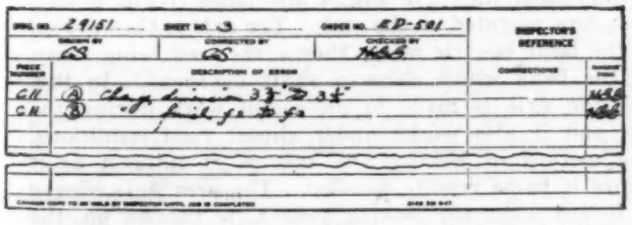


FIG. 3—CHECKER'S RECORD OF CORRECTIONS

used for adjustment; for parts bolted together; for cams, gears, pulleys, levers and other parts which require a true surface for squaring up and locating and attaching other parts.

F4—*Rough Machine Finish:* This finish is obtained with ordinary roughing tools. Used for surfaces which are needed only for lining up and locating and which are painted after the machine is completed.

F5—*Smooth Forge Finish:* (No machining required.)
Note:—*Surfaces will not be finished by the shop, unless marked,* excepting when it is noted in the heading of the detail that the piece is to be finished all over.

It was also found to be quite a saving to furnish the draftsmen with a list of all sizes of tool steel, drill rod, angle irons and other materials which were in stock. Previous to this a draftsman would often figure on certain sizes of material which were not in the storeroom, whereas if he had known what sizes were on hand he could just as conveniently have used one of the stock sizes. Of course it is necessary to bring a list of this kind up to date as often as possible.

There is one more point which might be worth while to bring out in connection with drafting room procedures. When I took charge of the drafting room I found that there was considerable friction between draftsmen and checkers. Upon investigation I found the main cause for this friction was the marking of the drawings by the checkers with a colored pencil showing the corrections to be made. Many concerns use this method and in most cases the colored pencil is used without much discretion, thereby causing considerable extra work in cleaning the drawing after the corrections are made. To remedy this trouble a printed form as shown in Fig. 3 was developed and made up in pads in duplicate as shown. By using this form the checker simply put a letter as *A*, *B*, etc., on the drawing alongside of the error and on the correction sheet explained fully all corrections to be made according to letters noted on drawing. The original copy of the correction sheet was attached to the drawing and returned to the draftsman for correction, the checker retaining the carbon copy for rechecking after corrections were made. This method proved to be a very satisfactory one both in time saving and reducing the friction between checkers and draftsmen. In addition this procedure eliminated the possibility of the draftsman erasing the corrections when making the changes, as noted by the checker, under the old system.

The above are only a few of the methods put into practice which helped to increase the efficiency and expedite the work of the entire engineering and tool departments. Similar results can be accomplished in any engineering organization if a certain amount of time and study is devoted to the work, and thought is given to the convenience of all men on the staff.

Rear Axle Making and Testing

Boring Housings — Automatic Switch Returns Assembly Trucks to Starting Point— Rear Axles Tested with Motor and Under the Car's Own Power

BY FRED H. COLVIN
Editor, *American Machinist*

THE Reo Speed Wagon uses a pressed steel rear-axle housing with the two halves riveted and welded as can be seen in Fig. 1. The central space for the differential housing is bored with a special boring head having inserted teeth which also faces the surface for the cover plate. The fixture holds the housing by the turned ends and supports the central portion on pins, one of which is shown at *A*. These ends can be adjusted up against the under side of the housing by the handwheel *B*. The angle pieces *C*, with their screw clamps, prevent side or end motion under the action of the cutting tool. The cutter is piloted below and driven by the substantial key *D*. The work is done on a Baker heavy-duty drilling machine.

A clever time-saving device for handling axle-assembly trucks is shown in Fig. 2. This shows a passenger

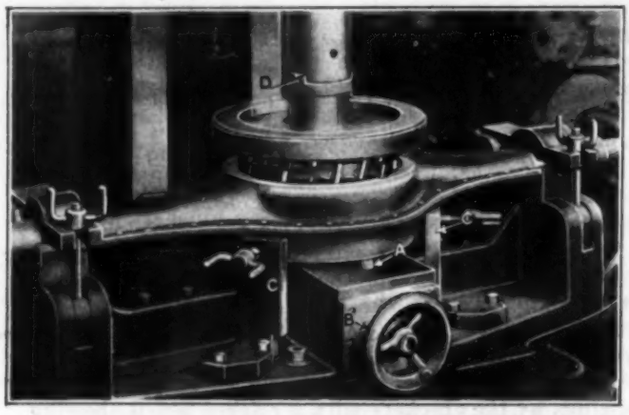


FIG. 1—BORING REAR-AXLE HOUSING

car axle mounted on the assembly truck *A*. The axle is now ready to be removed from the truck, which is then pushed to the right on the movable rails *B* and *C*. These rails are hinged and the weight of the truck throws them downward into contact with the lower, inclined rails. This gives the truck impetus and it rolls up the incline, clearing the swinging rails *B* and *C*. As soon as the truck is off these rails, the springs D and *E* lift the rails and the truck rolls back underneath and goes back to the beginning of the assembly line. The swinging rails are guided at the outer ends as at *F*.

Each pair of bevels for the rear-axle drive is tested

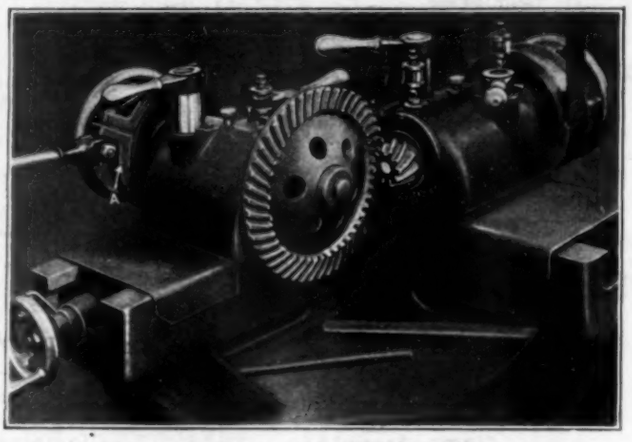


FIG. 3—MATING AND TESTING BEVELS

on the machine shown in Fig. 3. Both the bearing and the noise are carefully noted and selections made to secure the best results. The pinion is driven by power, as in the car, and the ring gear can be loaded by the brake at *A*. The meshing of the teeth is adjustable in both directions, micrometer graduations being provided on the handwheels.

After the axle is assembled it is mounted on the testing stand shown in Fig. 4 and large special wheels or pulleys mounted on the ends. The axle is then driven by the large electric motor shown, the load being taken by the belts which drive a shaft overhead. In this way the axle is made to do useful work during the test and it also works under almost road conditions. The method of holding the axle is of interest as it allows it to be readily handled. The arm A is hinged at *B* and when the locking yoke *C* is thrown up, the arm can be pulled forward. The arm also carries a bar which supports the axle when in the position shown. With the arm thrown forward the wheels can be rolled over the arm, and as it is lifted it raises the axle into position for testing.

When the chassis is completely assembled it is run to the test room shown in Fig. 5. Here it is backed into place, the rear end jacked up so as to slip the belts over the rear wheels, and the motors are started for their final test. This does not injure the tires in any way and allows the

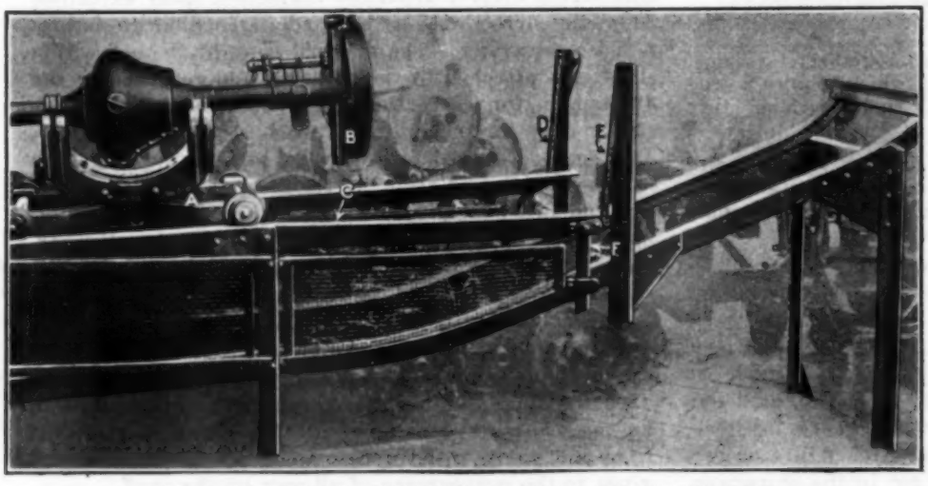
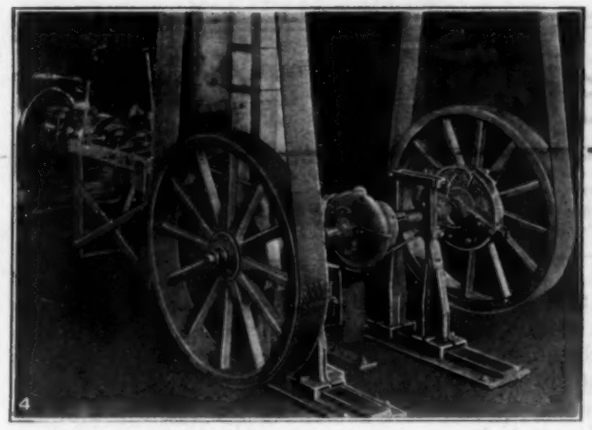


FIG. 2—RETURNING ASSEMBLY TRUCK AUTOMATICALLY



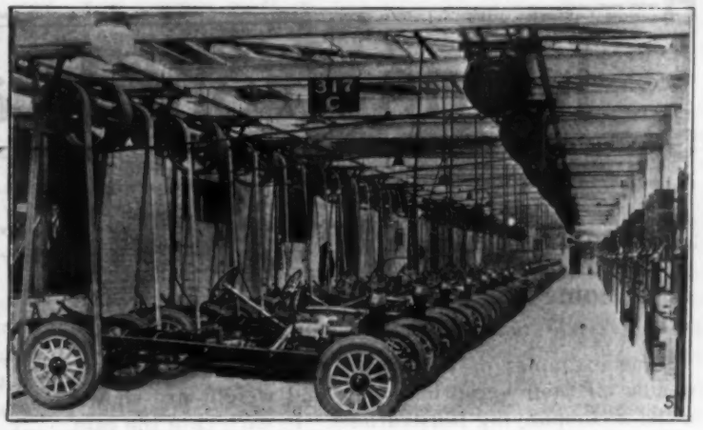


FIG. 4—TESTING AXLES UNDER LOAD. FIG. 5—FINAL TEST OF COMPLETE CHASSIS

wheels to be equipped with their regular tires before this test is made. With the chassis suspended by the chains shown the motor is run at varying speeds and the power delivered drives the generators shown overhead. Provision is made for carrying away the burned gases from the motors. This makes an unusual and interesting method of giving the final test before shipment.

As Not Told by the 1919 Census of Manufacturers

By T. Harrison

I notice on page 192 of *American Machinist* a little tabulation of the wages per wage earner and the profit and overhead in various kinds of industries. Everything is all right up to the end of the tabulation, but then the trouble begins in the form of certain things and remarks. For instance, it says: "From the above it would seem that it pays better in the matter of tools to make shovels and scoops and saws than it does machine tools. Also that it is an expensive luxury to run a foundry."

How a man can see all this from the tabulation is beyond me. When the profit and overhead for the foundry is $998, it may very well be that $8 is overhead and $990 profit and it is quite possible that it may be the other way. Similarly, when machine tools show for profit and overhead $1,643, we are still left in the dark as to how much is profit and how much overhead. To be short about it, profit and overhead together tell nothing in themselves.

Even the wage per wage earner tells very little for we do not know what is the percentage of highly skilled, ordinarily skilled and unskilled labor; the percentage of grown ups, boys and girls. To me it seems that the whole tabulation is a beautiful example of statistics gone astray. It may be said of all statistics that they are all right until somebody begins to draw conclusions. But, when they are as incomplete and as undeveloped as the tabulation given in the little article mentioned above, it would seem that they are without any merit or meaning.

Do Gear Speeds Vary?—Discussion

By Fred Ross Eberhardt

Gear Department Manager, Newark Gear Cutting Machine Co.

The questions brought up by A. L. DeVinne in the article under the above heading on page 72 of *American Machinist*, are natural and are easily answered. What is meant by the tooth curves being placed too high or too low, is the position of the curve produced by a formed milling cutter, if the cut is too deep, not deep enough, or off center. It is readily apparent that the involute curve may be put in the wrong place and rendered valueless as a gear tooth form.

If the tooth curves are not correct, "the relation of the gears will be intermittent or at least irregular—alternately fast and slow." This does not mean that the gears will perform acrobatic stunts visible to the naked eye. Even if the driver is revolved at a constant speed, it will transmit an uneven angular motion to the follower. This may be measured on the various types of gear testing machines which employ recording pens. An exaggerated example would be the motion imparted to a spoked wheel, without the rim, driven by a similar wheel, with the spokes acting as teeth. If a driving gear of great weight, running at a high speed, drives another gear of great weight, at a high speed, the flywheel action of the two gears will tend to prevent uneven angular motion. However, the incorrect tooth forms would cause some portions of the teeth to do all the work, and would induce rapid wear, vibration, noise, and tooth breakage.

With reference to the number of teeth in contact, the *maximum* number possible with the 14½-deg. standard tooth is 2.46. In gearing of the usual proportions, the number of teeth in contact may be two or less. If the tooth curves are incorrect, there will be less than 2.46 teeth in contact, and if they are very bad indeed, there may be only one tooth or less in continuous contact. If excessively incorrect, the teeth will break off as soon as the gears are set in motion and the teeth run with each other.

In his last paragraph, Mr. DeVinne mentions herringbone gears. If made with a sufficient face width to give continuous helical contact, these gears would run with an even angular velocity with teeth of almost any form, which explains why they are used for high-speed work. The helical contact, in addition to the regular involute action in the plane of rotation, tends to counteract any inaccuracies, and gives a greater smoothness of action. In selecting pressure angles for herringbone gears, the same rules may be applied as for spur gears.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Some Examples of Cam Cutting

By Milton Wright

Some examples of cam cutting that are of interest because of their exceptional size and weight are shown in the accompanying illustrations. In each case the cam grooves were cut from solid metal, the cutting being done upon a standard Rowbottom cam-cutting machine,

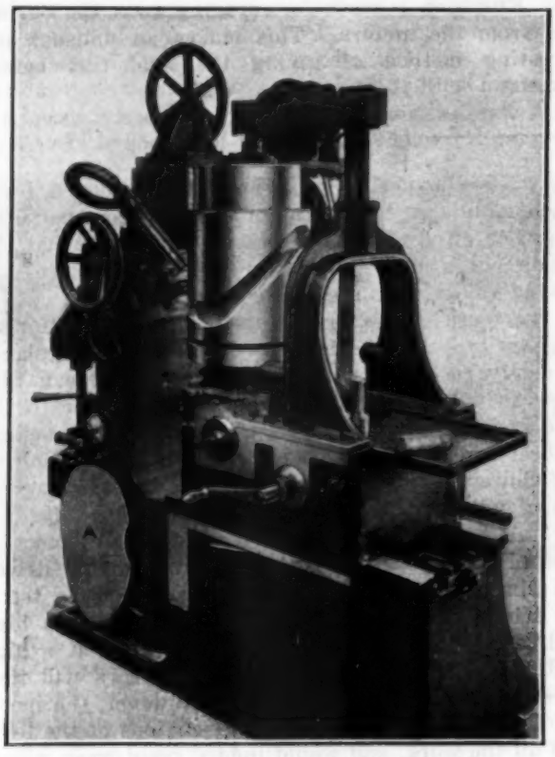


FIG. 1—THE CAM CUTTING MACHINE

in which the cutting tool is guided entirely by a master in the form of a flat plate cam.

This machine is shown in Fig. 1, where it has just finished cutting one of the cams, which, by-the-way, was one of an order of seven. The master cam appears at *A*, just below and to the left of the operator's position.

The completed cam as shown in place on the machine weighs approximately 500 lb., is about 3 ft. long and its largest diameter is 14 in. The central part is an arbor of cast iron over which is forced a shell of mild steel 22 in. long, 14 in. outside and 11½ in. inside diameter. Besides the force fit, the shell is secured to the arbor by numerous fillister head screws.

No preliminary lay-out of the cam surfaces upon the work is needed, though the points of reversal or change of direction of the groove are sometimes prick-punched thereon as a means of checking up as the work progresses. The cut is started with a cutter of small diameter which is fed radially into the work, as if drilling a hole, to a depth of about $\frac{1}{16}$ in., depending upon the nature of the material. The table movement is then started and the master cam and work revolve in synchronism, completing a revolution, in this case, in about 40 min. As each turn is made the cutter is advanced, and this is repeated until the full depth of the cut is reached.

Shifting the work endwise with relation to the cutter for a distance equal to nearly one-half the required width of groove less the radius of the cutter, the metal is cut away first from one side and then from the other of the line of action, leaving a groove that is from $\frac{1}{32}$ to $\frac{1}{16}$ in. less in width than the finish dimension, but conforming in all other respects to the requirements of the cam contour.

The final operation is performed with a cutter of exactly the same diameter as the follower roll to be used with the cam—in this case 2½ in. This is of prime importance, as is also the diameter of the follower, or guiding, roll used in connection with the master cam. Any discrepancy with respect to either would result in an incorrect contour.

The finishing cutter is fed in radially to the full depth of cut exactly at the center of the line of action of the cam, and cuts both sides of the groove simultaneously, removing a small amount of metal from each side and finishing the groove in one revolution of the work.

There must, of course, be a master cam for each *different* cam to be cut, and the laying out of this master is the work of an expert, though the actual making is simple. Disks of cast iron of the requisite diameter and about ½ in. thick are used for this purpose. The actual diameter of the master need bear no special relation to the dimensions of the cam to be cut, though the larger it is the less chance will there be for error.

A development of the line of action is first laid off on a drawing, circles corresponding in diameter to the size of the follower roll struck at intervals along this line, and the line of the two working surfaces drawn in to touch these circles. A straight line is then drawn at a convenient distance below the contour lines of a length to equal the circumference of the work and this line is divided into a number of equal spaces, the number of divisions corresponding to some number of

FIG. 2—A CYLINDRICAL OR "BARREL" CAM

degrees that will divide into 360 without a remainder.

Upon a heavily coppered or painted disk of thin sheet metal a circle is struck and divided into a number of sectors to correspond with the number of divisions upon the drawing. Assuming a definite length of radial line upon this templet as a starting point, the distance between the horizontal line and the line of action is measured upon the drawing at two adjacent division and the *difference* laid off along the next radial line upon the templet.

Proceeding in this manner a series of points are established upon the templet through which a line is drawn that represents the contour of the master. This contour may seem to the uninitiated to bear little resemblance to the contour of the cam to be cut, but it may be depended upon when in the machine to produce it. Having cut and filed the templet to match the line it is then turned over to a workman who, with drill and

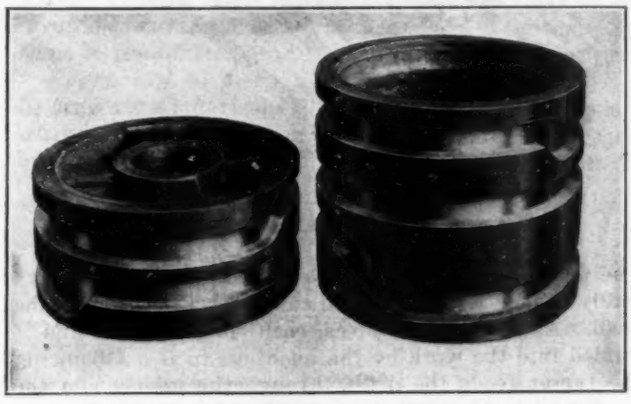


FIG. 3—TWO EXCEPTIONALLY LARGE CAMS

file, soon produces from one of the cast iron disks a master cam to correspond.

An interesting device is used in the lay-out department for laying out and checking the templet and also for checking the master after the latter has been completed. It consists of a bed, somewhat like the bed of a small lathe, at one end of which is mounted a freely revolving hub to turn about a vertical axis. Sliding upon the shears of the bed is a head that carries the barrel and thimble of a micrometer measuring instrument. The stud of the hub is of the same diameter as the stud of the cam cutting machine upon which the master cam goes, and having a keyway to correspond.

To check the templet or master cam it is laid flat upon the hub, the center hole fitting over the stud, and the radial position of the working line is determined at a given point. Turning the templet to the next division the radial position is again measured and the difference noted. Actual radial distances are unimportant; it is the difference that counts.

A "keyline" is struck radially upon the templet (which line may or may not correspond to one of the divisions) and this keyline is usually the point of departure from which measurements are taken. The position of the keyline with reference to any given point upon the line of action is established by conditions in the machine upon which the finished cam is to be used, and this relationship must be rigidly observed in all work upon the templet or master.

Given a correct master, any number of cams of corresponding contour may be cut upon the cam cutting machine with little attention from the operator, who may devote most of his time to other work or may handle a battery of similar machines. An air blast upon the cutter keeps it cool and removes chips as fast as they are formed.

In Fig. 2 is shown a cam similar to that shown upon the machine in Fig. 1, but having a groove for a 6-in. diameter roll. In Fig. 3 two larger cams are shown, both cut upon the same machine. They are each 28 in. in diameter; one being 23¼ and the other 13 in. long, and weighing 1,575 and 1,075 lb. respectively. The roll grooves are all 3 in. wide by 1½ in. deep, being cut through the full thickness of the steel shell. In the larger cam 350 lb., and in the smaller one 220 lb. of metal were removed in cutting the grooves. The reader will realize that these were machining operations of considerable size, so that they were not easy to perform.

Catching the Thread by the "Jump" Method

By John Hansen

On page 970, Vol. 56, of *American Machinist*, appeared an article by B. A. Donley entitled "Catching the Thread by the 'Jumping' Method," and in this article is a statement to which I want to take exception. The statement is: "In any event it is far quicker than stopping the lathe and scaling for position, which is the only other method possible under the conditions."

As to speed, the method that the writer uses might be slower under certain conditions than the one described by Mr. Donley; but it is faster under the majority of conditions.

Years ago, while serving my time as apprentice, a job of cutting 31 threads per in., 19 in. long, and 7 threads per in., 30 in. long was frequently given me. We did not have a dial on the lathe, but a reverse belt. The time required to bring the carriage back to the starting position was too long a wait and the problem was reasoned out this way: That, if the tool could be brought back to a fixed starting point every time and the spindle and leadscrew to the same relative position, the tool would be right in the lead.

Actually, the problem was worked out as follows: The carriage was run back against the tailstock, the spindle was then turned until the locknut would engage the leadscrew without side motion of the carriage. A chalk mark on the top of the faceplate and top of the leadscrew would then indicate this position and everything was set for cutting the thread without using the reverse belt for bringing the carriage back. A cut would be taken the desired length, locknut disengaged and carriage brought back with the left hand while the right hand was working the shifter to bring the marks on the faceplate and leadscrew up again.

By the time the carriage was back against the tailstock the marks would coincide and the locknut could be engaged to the leadscrew and the next cut would be taken. This continued until the thread was finished. The number of threads to be cut and the number of threads on the lead screw are immaterial. The method works under all conditions. It does not require any skill. It is positive, and it also shows that the method described by Mr. Donley is not the only one possible under the circumstances. If the nature of the work does not permit using the tailstock as a stop, a clamp can be attached to the ways or a line drawn to indicate the starting point of the threading operation.

Multi-Drilling in the Turret Lathe

By Irving Lake

Having on numerous occasions been required to lay out tools to machine such parts as wheel hubs, flywheels, pipe flanges, ring gears and other numerous turned parts that required multi-drilling operations, I came to the conclusion that in a good many cases the multi-drilling could be accomplished with greater speed and accuracy if it could be done in the chuck in which the work was turned.

The particular problem was to find a drilling head that could be attached to the turret and would drill six ¼-in. holes, equally spaced on a 2¼-in circle. The piece was a cast-iron disk, ⅜-in. thick, 2¾ in. outside diameter, bored and tapped 1½ in. 11 threads per inch and machined all over. After searching widely for such a drilling head and being laughed at, (either openly or after leaving) and told it couldn't be done, I decided to build one myself. After several trials I got together a head that would drill the required holes without stopping the machine which ran at 150 turns per minute. The drills are geared 4 to 1 which gives them a speed of 600 r.p.m.

This multi-drill head works on the same order as a collapsing tap or die, being pushed up against the revolving piece of work and withdrawn when its job is done. This method of drilling uses a standard 6-in. Cushman three-jawed universal chuck. The drills pierce the work so as to miss fouling the jaws. With the jaws recessed it is possible to drill twelve holes on the same circle of 2¼ in. at one contact.

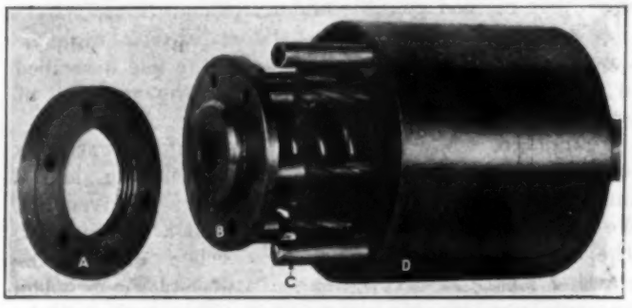


FIG. 1—THE DRILLING HEAD AND THE WORK

Of course there are limits to the size of head which can be used on the different turret machines, such as the swing over the cross-slide and the clearance over the top of the turret slide. On the upright multiple station type of machine, the size of multi-drill head can be greatly increased. It is possible to build a head to drill a set of holes in the rims or hubs of flywheels, as there is no overhang to cause any trouble and the full diameter capacity of such machines is available at each station.

It is sometimes necessary with the present equipment to make two operations of the drilling where the holes are very close together. In this case six or more holes are drilled through the piece, the piece is then indexed and drilled again between the previous set of holes. This procedure is made necessary by the type of gearing used and the size of the spindles on the multi-drill preventing a closer nesting of the drills. With the head as shown all of the necessary holes can be drilled at one contact, with the work running at whatever speed proves proper for the facing or forming tools. Owing to the fact that this drill head revolves with the work the resulting chips are thrown away leaving the drill head and work-holding chuck of the fixture clean.

The flange to be drilled is shown at *A* in both Figs. 1 and 2. The friction flange *B* contacts with the work and revolves with it, the pins *C* go between the chuck jaws and give a positive drive to the drilling head *D*.

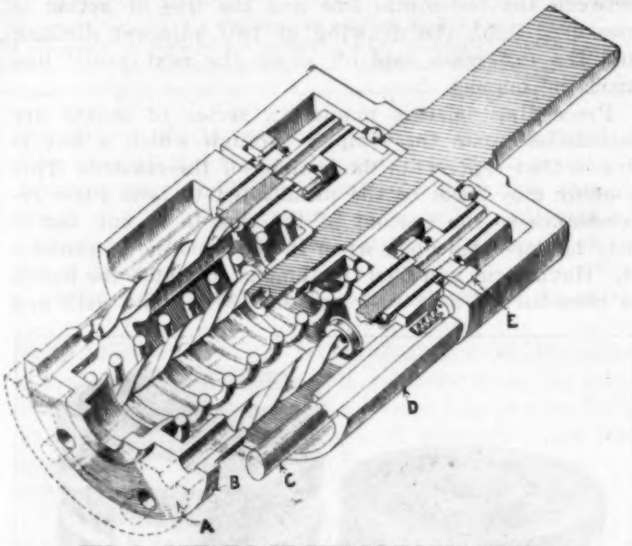


FIG. 2—DETAILS OF THE DRILLING HEAD

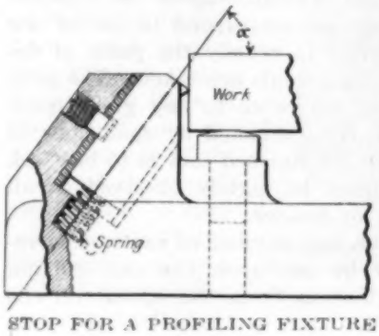
The gears on the drill spindles mesh into a stationary internal gear *E*, Fig. 2 fixed to the back portion of the head. As the head revolves, each spindle turns, and is guided into the work by the bushings in *B*. Advancing the turret feeds the drills through the flange, and the work is done.

Stop for a Profiling Fixture

By Edward H. Tingley

The illustration shows a stop for a profiling fixture that was developed and used successfully by the Delco-Light Co., Dayton, Ohio. In the past, solid stops have failed to hold the work down in all cases and fulcrum finger stops had the fault of coming up above the face of the work to be profiled, except on thick work. The stop embodies the good points of both other styles as the top of the stop comes below the face to be machined and also holds down the work in a very positive manner.

Experiments were made to determine the limits of the angle α that the stop must have with the work and it was found that the stop worked equally satisfactory with any angle from 25 to 45 deg. The stop itself and the bushing in which it slides are both tool steel hardened and ground. It will be noted that there is a small spring at the bottom of the stop which allows the stop to lift the work up when the screw V-block is released and permits it to drop down to lock the work. A screw in the side of the stop keeps it from lifting out or being lost and as the end of the screw is smaller than the slot in the side of the stop, sufficient play is allowed so that the work can lock on the plug.



STOP FOR A PROFILING FIXTURE

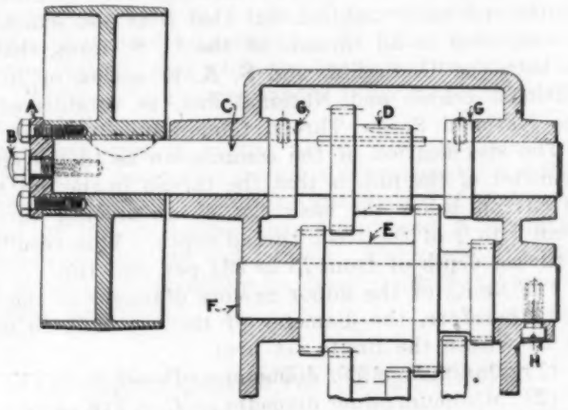
Holding Pulleys and Shafts

By Leroy M. Curry

A pulley fastening devised to meet certain conditions is shown in the accompanying illustration. Shaft *C* was made of cold-rolled or ground shafting without turning or grinding. The sliding gear *D* meshes alternately with gears on sleeve *E*, which turns on stationary shaft *F*. Retaining collars are shown at *GG*.

The cap *A* serves the purpose of holding the pulley firmly in the correct position on the shaft, the actual driving being through the key. The cap is also an aid in removing or replacing the pulley. The central hole in the cap is drilled larger than the ½-in. screw *B*, and tapped with a standard thread. The pulley can be removed by unscrewing *B* and screwing a larger screw into the cap, thus forcing the pulley off the shaft. In replacing, a ½-in. screw of extra length would be used to reach through the hub of the pulley and into the shaft. If used in an exposed location, a metal cap can be used to cover the screw heads, or the design modified so as to use fillister-head instead of hex-head capscrews.

A setscrew is often a very undesirable method of holding a stationary shaft in a machine frame, especially when it must be placed on the outside, and the boss must have a rather thin wall of metal surrounding the shaft.



METHOD OF FASTENING PULLEY AND SHAFT

Besides being unsightly, there is always the probability of the screw stripping the threads in the hub or boss, or of cracking the casting. This can be obviated by using a fillister-head screw tapped into the shaft as shown at *H*. Of course, this method cannot be used on very small shafts or rods.

Fixture for Drilling Round Shafts

By Robert Tait

In automotive repair work it is often necessary to make valves with slotted stems as shown in Fig. 1, and unless a shop has special equipment it is not an easy task. The fixture shown in Figs. 2 and 3 is easily made. It is convenient, not only for valve work but also as a V-block for use in drilling small holes centrally through round stock of any kind. The drill bushing can be clamped in position close to the work thereby giving maximum support and rigidity to the drill.

This particular fixture is 4 in. long by 3 in. wide and will accomodate ⅝-in. round stock. Details can easily be modified to suit requirements.

The work holding member *A*, which is swung down in Fig. 2 to show the details more clearly, has its shank graduated with a series of annular lines ⅛ in. apart as at *B*, Fig. 3; this acts as an aid in spacing holes. The work holder is hinged in a block *C*, Fig. 2, so that

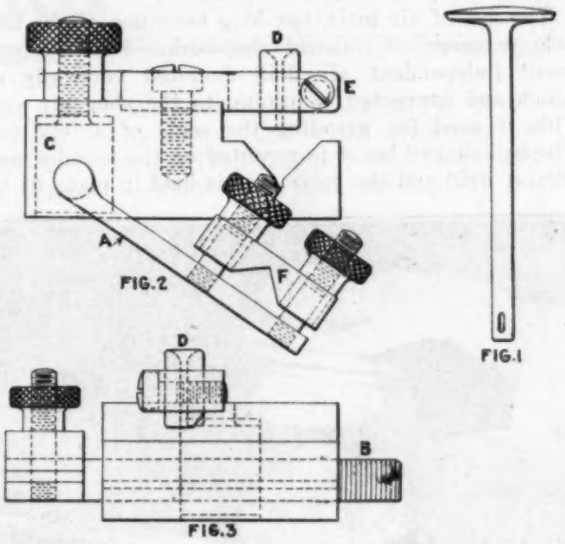


FIG. 1—THE VALVE TO BE DRILLED. FIG. 2—DETAILS OF DRILLING FIXTURE. FIG. 3—SIDE VIEW SHOWING GRADUATIONS

it can be moved to get the work in the desired relation with the bushing *D*. The locking member *C* which is omitted in Fig. 3, is the same as that usually found on surface gages and similar devices. The drill bushing *D* slips through the plate *E* and can be readily removed or adjusted as to height. It is clamped by a screw as shown.

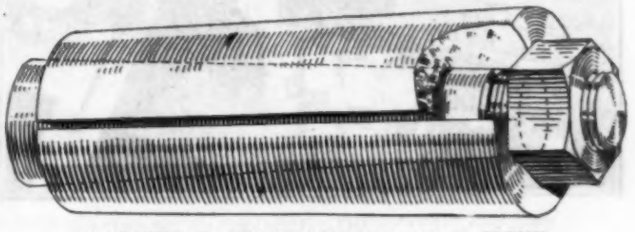
In use the work is clamped by the strap *F* and brought to the proper position for the first hole. Block *C* is tightened, and the hole drilled. After enough holes have been drilled to get the required length of slot the work is moved to such positions as will admit of drilling out the remaining stock between the holes. It will be found that a neat job can be done quite rapidly.

Crosshead Pin That Will Stay Tight

By C. D. Michener

It is the general practice in some shops to make crosshead pins with a taper at each end. Pins so made will sooner or later work loose.

To make a pin that won't work loose, make the outside parallel the whole length, bore a taper hole in it and cut a slit through one side. Fit a pin in the taper hole and cut a thread on the small end for a nut. The



CROSSHEAD PIN THAT WILL STAY TIGHT

accompanying sketch shows the idea. Put the crosshead pin or "bushing" in place and expand it by driving in the taper pin and screwing the nut up tight. This kind of a repair job never comes back.

Grinding Valve Seats and Cutting Oil Grooves

By I. B. Rich

The use of air tools, has long been one of the noticeable features of railroad shopwork. Fig. 1 shows a small Independent air drill mounted vertically on a bench and connected by piping to the shop air supply. This is used for grinding the seats of safety valves. The ball shaped lap *A* is mounted on the spindle nose of the air drill and the valve seat is held in place by hand,

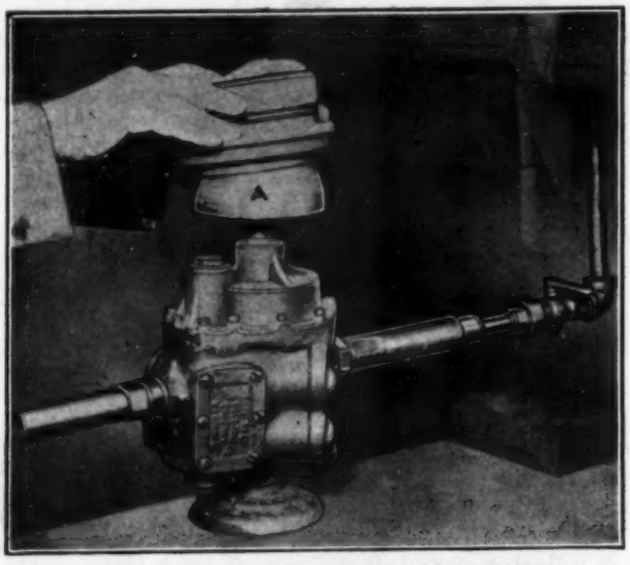


FIG. 1—AIR GRINDER FOR VALVE SEATS

being moved around on the ball to prevent grinding rings in the seat. This makes a rapid as well as an easy method of doing this work.

The use of electric headlights involves motor and generator bearings which require renewing at fairly frequent intervals. Fig. 2 shows a method of cutting the oil grooves in these bearings that is interesting and also a time saver.

The head *A* is mounted on the Fox lathe shown and

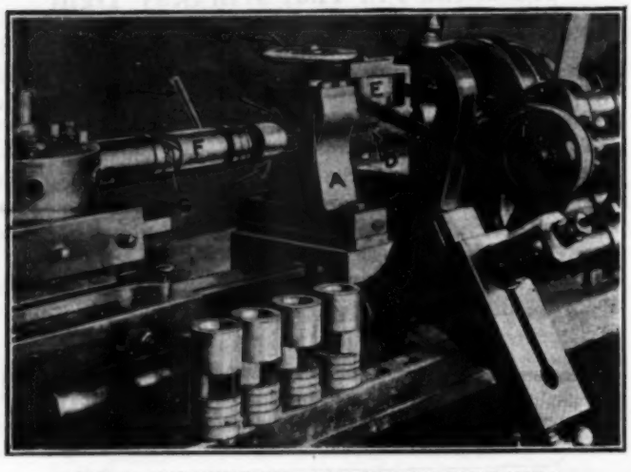


FIG. 2—CUTTING OIL GROOVES IN BEARINGS

carries a small milling spindle in the front end of the bar *B*. This spindle can be moved vertically by the handwheel *C* to regulate the depth of the cut. The milling spindle is driven by a small chain *D* which gets its motion in turn from the belt-driven pulley *E*.

The bearing to be grooved is placed on the holder *F* which is in the turret of the lathe. This holder carries a pin fitting into the groove *G* so that when the holder is turned by the handle *H* the holder and the bearing *I* are moved in the same path as the groove shown. This gives just the oil groove desired, which can, of course, be varied by using bars with different grooves. As shown this device cuts a sort of figure 8 groove which does not run out at the ends. A little practice enables an operator to groove these bearings very rapidly. Both these kinks are from the Readville, Mass., shops of the New York, New Haven & Hartford Railroad.

Formula for Tap Drill Size—Discussion

By H. W. Bearce

Executive Secretary, National Screw Thread Commission

A simple and easily remembered rule for calculating the tap drill size was given by J. R. Owens on page 935, Vol. 56, of *American Machinist*. The rule was: "Subtract the fraction represented by the pitch from the nominal size of the tap." Mr. Owens stated that this rule was recommended for the ordinary run of work that does not require exact figuring.

I should like to point out that not only is the rule simple and easily applied, but that it is also exact. It is adaptable to all threads of the U. S. form, that is, to both the U. S. Std. and S. A. E. series, or to the National coarse and National fine, as established by the National Screw Thread Commission.

The specification of the commission as to the minor diameter of the nut, is that the thread in the nut shall be cut off below the basic flat by an amount varying from $\frac{1}{4}$ to $\frac{1}{8}$ of the basic thread depth. This results in a thread depth of from 75 to 83⅓ per cent full.

The limits of the minor or core diameter of the nut, and, therefore, the diameter of the tap drill, in order to be within the limits set are:

(1) Maximum minor diameter $= D - 2(h - \frac{1}{4}h)$
(2) Minimum minor diameter $= D - 2(h - \frac{1}{8}h)$
(3) Maximum minor diameter $= D - 1\frac{1}{2}h$
(4) Minimum minor diameter $= D - 1\frac{3}{4}h$

D = basic diameter of tap
h = basic diameter depth
$h = 0.649519p$
$p = \frac{1}{n}$
p = pitch
n = number of threads per inch.

Substituting for h in (3) and (4), the equivalent value $\frac{0.649519,}{n}$ equation (3) reduces to:

$$\text{Maximum tap drill} = D - \frac{0.97428}{n}$$

equation (4) reduces to:

$$\text{Minimum tap drill} = D - \frac{1.08253.}{n}$$

It is therefore seen that the equation given by Mr. Owens:

$$\text{Tap drill diameter} = D - \frac{1}{n}$$

lies between the maximum and minimum permissible minor diameter. Since this value is somewhat nearer the maximum than the minimum size, the power requirements and the tap breakage should not be excessive, and the drill size should be as satisfactory as any that could be selected.

Editorial

Eliminating Unnecessary Machine Sizes

THERE seems to be a growing feeling among engineers and machine-tool builders that there are too many sizes of machines in various lines to make it possible to manufacture or sell economically. For, while slight variations in size may occasionally aid in securing an order from a competitor, it is very probable that if all the costs were carefully kept, the sale would prove unprofitable.

The bad feature of this practice of overlapping sizes is that it adds greatly to the shop overhead in the way of tools, fixtures and gages and also that it swells the inventory of machines in process or in stock. When improvements are made they must be applied to a needlessly large line, all of which adds to the cost of doing business.

In too many cases these odd-sized machines are designed simply to secure orders which would naturally go to the next standard size if there were none in between. Extended capacities are too often subterfuges for price cutting, and while no one questions the right to do this, there are many doubts as to its being really profitable in any way.

The advantages of having a few sizes of machines is particularly noticeable during a depression or a deflation period. Money tied up in twenty sizes of machines instead of ten, is harder to get out and is of little assistance in meeting the payroll. The present movement toward standardizing on fewer sizes is a step in the right direction.

Varied Equipment for Shop Schools

TRADE schools, and others under whatever name, using machine tools, will soon be considering new equipment of lathes, drilling machines and the like. As the selection of these machines has a direct bearing on the education of the boys who will use them, great care should be used in picking this equipment.

In many cases, owing both to a lack of funds and also a lack of realization as to the effect on a boy's training, machine tools for schools are selected solely on a price basis. The idea seems to be that "anything is good enough for a boy to learn on." Nothing could be more erroneous.

The school is simply a preliminary to the boy's life of usefulness after he goes out into the world. It should teach him to handle the kind of machines he will find when he goes into the average shop. There he will find cheap lathes and expensive lathes, lathes poorly designed and built, side by side with the best. He should know how to get the best work possible out of each kind.

It might even be well to have one machine in which the bearings were a trifle worn, the ways out of line and with a few other defects which are fairly common in many shops. This could be used as a horrible example to show the effect of these conditions on the work. There is nothing like knowing what to look for when any machine gives signs of trouble.

Instructors in shop schools should give the question of selecting machine tools and other equipment very careful consideration. They should always bear in mind that instruction in shop work, and especially in work under shop conditions, is the prime fact to be considered. No small part of their success as instructors depends on the equipment with which the boys are taught. It need not be extravagantly expensive but it should be good and it should be representative of shop conditions; which means that it should be varied.

What About Machine Tool Prices?

EVERYBODY wants to buy at the bottom of the market and sell at the top, but not everybody knows enough about the market to recognize either the top or the bottom when he sees it. It makes little difference what the market is, potatoes, beaded bags or machine tools, the statement holds good. The sensible citizen is content if he can buy somewhere near the bottom and sell within a reasonable distance of the top.

As to potatoes or beaded bags we do not pretend to any market knowledge, but when it comes to machine tools we are convinced that for most lines the bottom was passed some weeks ago. In fact, increases have been announced in some of them already and other such announcements must come soon.

Let's see why. Machinists the country over have read with interest the display advertisements of the railroads offering seventy cents an hour for railroad shopmen. The railroad shopmen say they cannot live on their reduced wages but other machinists doing equally good or better work have had to live on as low as forty cents an hour and are still doing so. Here is a situation that cannot continue. Not only will there be a protest from the machinists in the machine tool industry but the builders themselves will be glad to take the first opportunity to raise the wages of their men. Nothing can be done until prices go up, but one increase will follow the other closely.

Coal is going to be scarce this winter and at least as expensive as it was last winter, probably more expensive. The administration's rationing plan may serve to keep industry going but will not supply cheap fuel.

Keen competition has kept prices of machinery castings low but increases in costs of pig iron and fuel are bound to be reflected in the cost of castings to the machine tool builder. Other raw material is increasing rather than diminishing in cost.

Selling expense is likely to increase because of keener competition and overhead has been pared to the bone.

The obvious conclusion from a survey of the facts just mentioned is that the next price announcements as regards machine tools will be increases and not cuts. Not only is the machine tool builder up against rising costs, but he is also waking up to the fact that he never has charged enough for the product of his brains and skill.

On a rising market far-sighted men buy in advance of their needs.

Shop Equipment News

Cleveland Double-Ended Automatic Threading Machine

A fully automatic machine having two heads and adapted to high-speed threading has just been placed on the market by the Cleveland Automatic Machine Co., Cleveland, Ohio. The outstanding feature of this machine is its ability to thread simultaneously both ends of a forged or rolled staybolt, so that both threaded ends are in line and the lead is continuous from one threaded portion to the other. The fact that the center part of the bolt is always more or less out of line with the ends, does not affect the action of the machine.

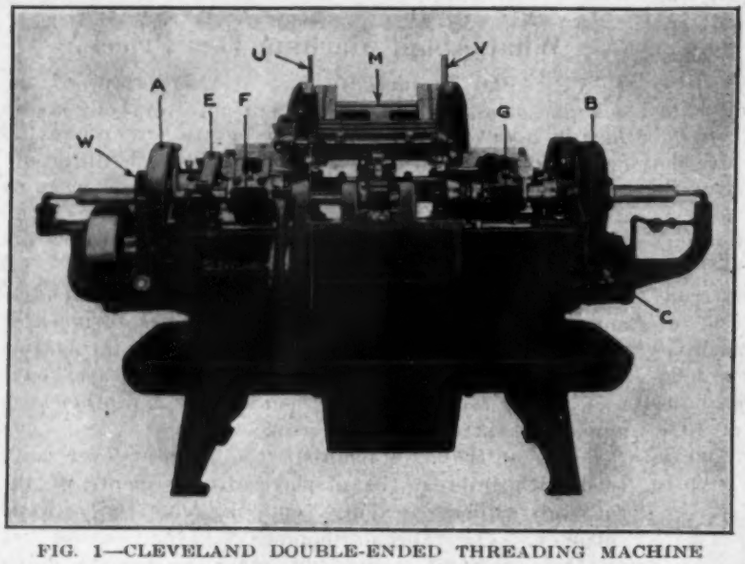


FIG. 1—CLEVELAND DOUBLE-ENDED THREADING MACHINE

The machine, a general view of which is shown in Fig. 1, consists primarily of a hopper which holds a supply of staybolt blanks sufficient to keep the machine busy from 40 to 55 minutes; a work-feeding mechanism, a pair of floating jaws which hold the staybolt and present it to the dies so that both ends are in exact alignment; two substantial spindles carrying the die-heads; a large lead screw with long bronze nuts; and suitable cams and connections for operating the various parts automatically.

The spindles are driven from the main driving shaft by gears at *A* and *B*. The feed shaft *C* is driven by helical gears and, in turn, drives the camshaft through change gears conveniently located in the box *D*, Fig. 2. These gears regulate the speed of the camshaft to suit different lengths of threads to be cut. The lead screw is mounted directly back of the die spindles and is driven by gears at *E*. Two die slides *F* and *G* are controlled by the lead screw during the cut, after which the heads are opened by stops at *H* (see Fig. 3), the lead screw nuts are tripped by cams *I* and *J* (Fig. 2) and the slides are returned rapidly by means of cams on the cam drums *K* and *L*. When the dieheads are just clear of the work, the work-holding jaws open and move backward, ejecting the finished staybolt, which drops into the pan. The mechanism then operates to place a rough staybolt in position for threading.

Part of the backward movement of the toggle mechanism for controlling the work-holding jaws withdraws the slide on which the jaws are mounted, and allows another staybolt to drop from the magazine *M* into the lower end of the carriers *U* and *V* in Fig. 1. These carriers then move down, bringing the blank in line with the dies. The toggle mechanism advances the slide with its jaws open until the latter are ready to close on the staybolt, at the same time seating the bolt against two V-blocks which line it up correctly. The jaws then close on the bolt, the two carriers return to their upper position, and the die moves forward.

The bearing spring shown in the upper jaw *N* in Fig. 3, allows for any variations existing in the diameters of the centers of the bolts. The two parts of the gripping jaws are pivoted on the stud *O*, and operated by the toggle *P*, which is moved by the lever *Q*. The lever in turn is controlled by cams at *R*, Fig. 2, through the lever *S* and bar *T*. The lower end of the slot in lever *Q*, Fig. 3, is enlarged to give a slight movement, allowing the jaw slide to shift forward or back and the jaws to oscillate or float on stud *O*, to accommodate a bent staybolt, which is frequently encountered.

In setting up a job a master staybolt or long-thread gage is inserted in the dieheads, one of which is then closed on the threads of the master or gage. Then, by a fine adjustment provided for the purpose, the other diehead is brought to a position where it will also close on the threads. Thus the heads are set so as to produce threads at each end that are continuous in lead.

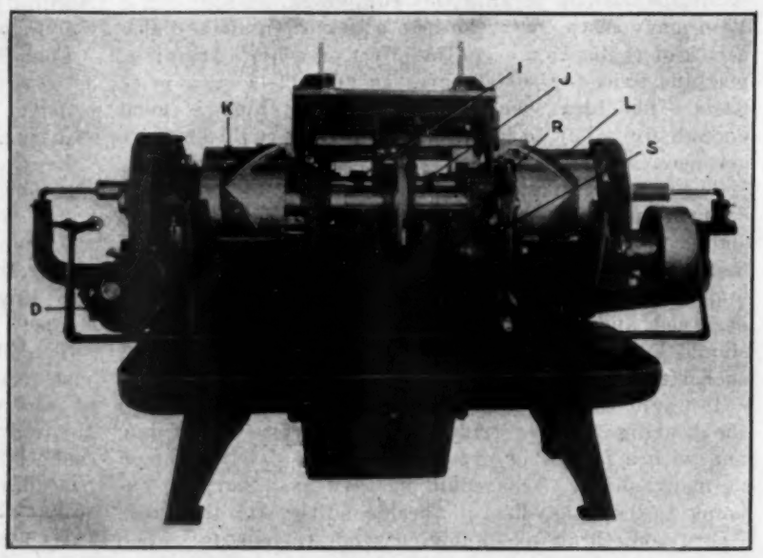


FIG. 2—REAR VIEW OF CLEVELAND AUTOMATIC

A safety or shearing pin is provided to prevent damage should a blank be too much out of shape. A heavy stream of cutting oil is pumped through each spindle to wash out chips and cool and lubricate the chasers. Starting and stopping is controlled by handle *W*, shown in Fig. 1, which operates the friction clutch.

The machine threads staybolts up to 1¼ in. in diameter and from 7 to 18 in. long. The time is from 35 to 60 seconds per bolt, depending on the diameter and length of thread. Practically no time is required for chucking the work, as compared to that taken when chucking by hand, and the time of cutting a bolt is that needed for threading the longest end.

One man can operate five machines, as all that is

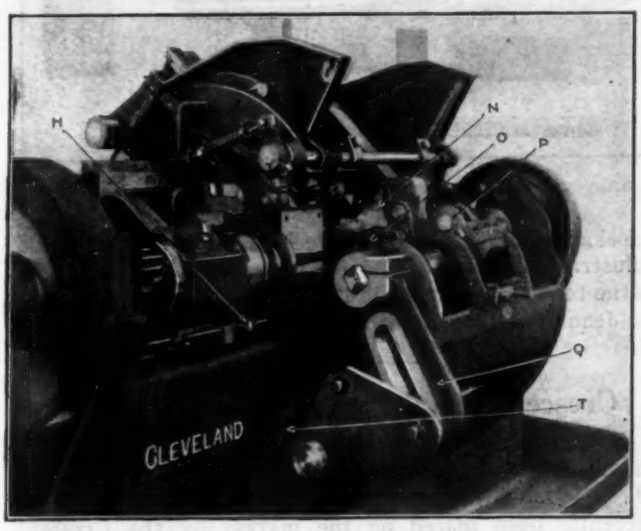


FIG. 3—DETAILS OF THE CLAMPING JAWS

required is to keep the magazine full, keep the chasers sharp and remove the finished bolts. Although designed for staybolts, the machine is equally useful for all double-ended turning and threading work such as on studs, pipe nipples and short shafts.

"Duwell" Motor-Driven Bench Grinder

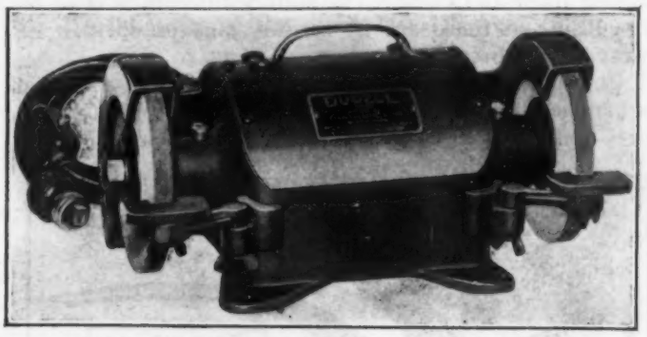
A motor-driven bench grinder designed for service in machine shops and such shops as garages, where a light, strongly driven machine is needed for tool grinding, polishing, wire-brushing and general utility purposes, and where it may not be convenient to provide a countershaft and belt drive, has just been placed on the market by the J. A. Finley Co., Grinder Division, 20 Braintree St., Allston, Mass.

The device carries two grinding wheels 5 in. in diameter by ½ in. face and runs at a speed of 4,500 r.p.m., giving a peripheral speed of approximately 5,900 ft. per minute. The wheel spindle is of steel, is ground, and runs in dust-proof parallel bronze bearings.

Power is supplied by a universal motor of special construction, which drives the spindle through reduction gearing consisting of a steel pinion on the rotor shaft meshing directly with a fiber gear on the spindle. Because of the geared drive the wheel spindle is mounted well toward the front of the machine, thus rendering the wheels accessible for grinding long pieces without interference with the frame.

The case in which the motor and reduction gearing are contained is closed by a tightly fitting cover that excludes dust, yet is easily removable to facilitate inspection and adjustment. The universal motor runs equally well upon either direct or alternating current, and is wound for 110 or 220 volts as may be specified.

The height of the machine from base to wheel center is 3 in. and the distance between wheels is 9¾ in. The



"DUWELL" MOTOR-DRIVEN BENCH GRINDER

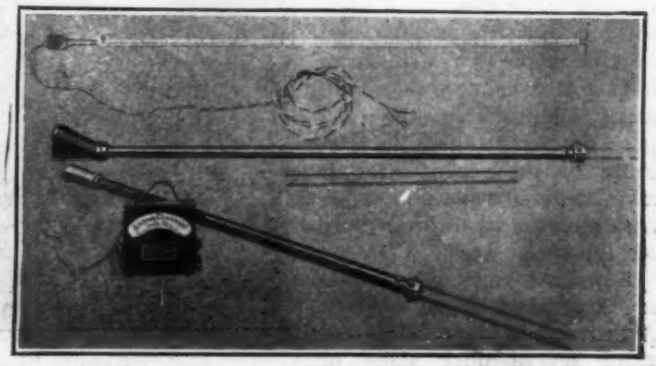
machine as shipped is provided with cord, switch and attachment plug, ready for connecting to any convenient lamp socket. Detachable wheel guards and toolrests for each wheel are also furnished. Four bolt holes in the base provide means for permanently attaching the machine to a bench or pedestal. The weight is 25 pounds.

Hoskins Portable Pyrometer for Molten Metals

A pyrometer outfit capable of giving instantaneous temperature measurements of molten metals and having renewable thermo-couple ends is shown in the accompanying illustration. It has recently been placed on the market by the Hoskins Manufacturing Co., Lawton Ave. at Buchanan, Detroit, Mich. The apparatus consists essentially of a standard Type-PA portable meter and a specially constructed thermo-couple.

The two bare wires on the end of the couple are renewable. They are ordinarily furnished in lengths of 16 in. and can be used until only a few inches in length. They are inserted bare into the molten metal, such as brass, bronze, aluminum, copper or babbitt, and the temperature can be read almost instantly on the meter. The upper temperature limit at which the equipment should be used is about 2,200 deg. F. Since setscrews hold the wires in the brass fixture on the end of the tube, replacement requires but a very short time.

The scale of the meter used is graduated directly in degrees from 32 to 2,500. The case is made of cast aluminum and has a black enamel finish. It is approximately 6¼x6x3 in. in size and weighs 5 lb. Twenty feet of flexible copper cord connect the couple and meter.



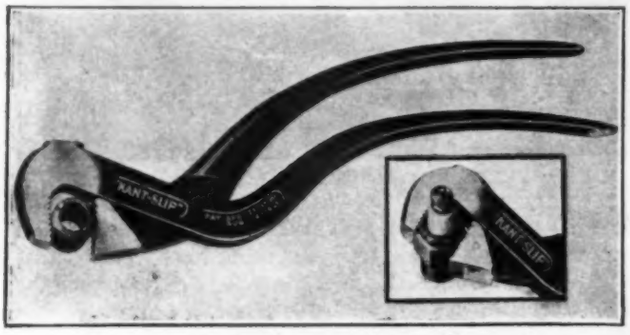
HOSKINS PYROMETER FOR MOLTEN METAL

Allan-Diffenbaugh "Kant-Slip" Wrench

The wrench illustrated herewith has recently been placed on the market by the Allan-Diffenbaugh Wrench and Tool Co., Baraboo, Wis.

The wrench will grip work of any shape and readily adjust itself as to size. The sliding fulcrum is close to the load and there are no screws, pins or springs to wear out or break.

On top of the stationary jaw is a raised flat, forming a hammer head and enabling the wrench to be used as a hammer for light blows. The opposite end of the



"KANT-SLIP" WRENCH

stationary member is formed into a screwdriver. The maker claims that when used as a pipe wrench, it will not crush the pipe; also that the wrench will perform all the functions of a monkey wrench.

De Bats Metal No. 4

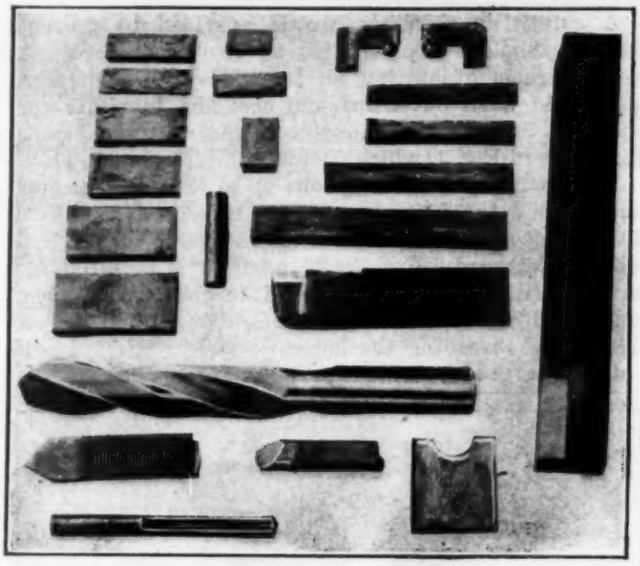
De Bats Sales Inc., 60 South St., Boston, Mass., is marketing a non-ferrous alloy of the tungsten-chromium-cobalt class for which remarkable claims are made in the way of speed and endurance cutting on cast iron and the higher alloy steels.

De Bats metal has the appearance of steel, though it contains no ferrous compounds and is non-magnetic. It is melted in electric furnaces and cast in molds of steel in the form of toolbits, inserts for built-up milling cutters, twist drills, reamers, etc., as shown in the accompanying illustration.

The metal cannot be forged, nor can it be annealed; the only means of working it being, therefore, by the grinding process. It may be produced in the simple forms referred to with little need for finishing operations.

The metal is very dense, is claimed to be free from blow holes and internal strains, and to possess a high resistance to impact that renders it particularly adaptable to the purpose of a cutting tool. Because of these properties it may be given rake and clearance angles approaching those of high-speed steels.

Standard sizes of toolbits are furnished to be held in Armstrong holders, while for more severe duty slabs or



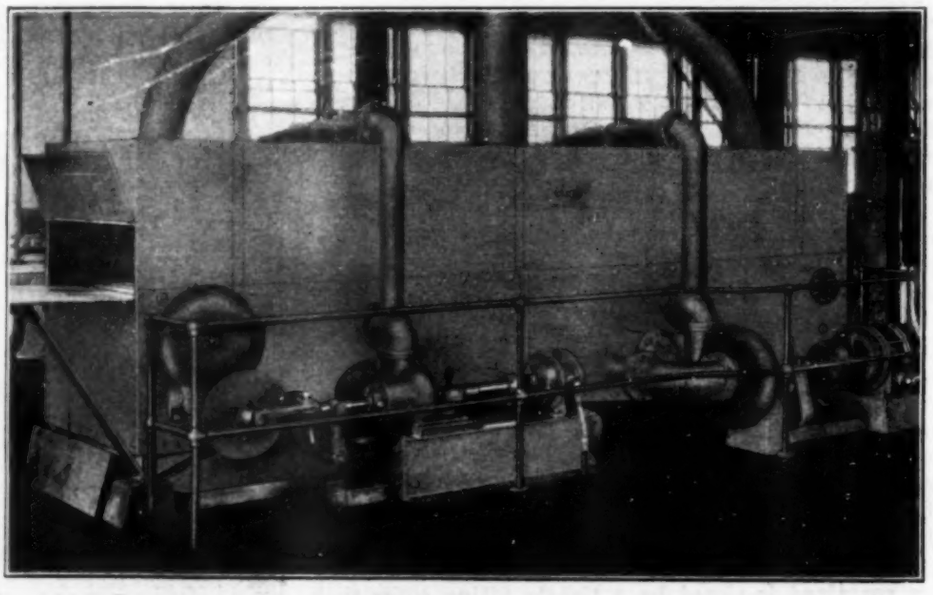
DE BATS METAL NO. 4

blocks are welded to carbon steel backings. In the above illustration all the pieces shown except the two larger lathe tools are entirely of De Bats metal. The inventor is Jean H. L. De Bats.

Crescent Metal-Parts Washing Machine

A large machine for washing metal parts that are handled in quantities of 50,000 to 100,000 or more per day, is shown in the accompanying illustration. It has recently been placed on the market by the Crescent Washing Machine Co., New Rochelle, N. Y., the machine shown being installed in the plant of the Crane Co., Chicago, Ill.

The machine is arranged to care for both the washing and rinsing, as well as drying when that is required. In this respect it is somewhat different from the machines formerly made by the concern, as small, compact, self-contained units that could be grouped as required by the work were built. Thus, separate machines were



LARGE CRESCENT METAL-PARTS WASHING MACHINE

formerly used for washing and rinsing when these two operations were necessary at the same point.

The large machine is well adapted to the manufacture of automobile parts. It is fitted especially to cleaning that class of work requiring great force and volume of water, the volume being more important that the force for quick and effective cleaning of metal.

The machine will clean objects 24 in. high, 40 in. wide, and if necessary, as long as the machine itself. It is 16 ft. long, 4½ ft. wide, and 5 ft. 3 in. high. The work level is 34 in. above the floor. The body of the machine is made of 10-gage steel plate that is supported throughout its length by 6-in. channels.

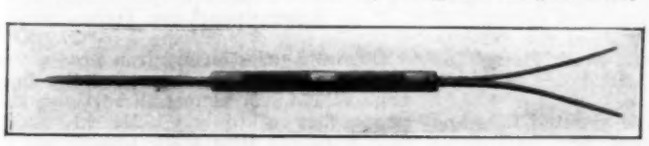
The chamber into which the work is first introduced has four sets of two-arm upper and lower revolving washing units for spraying the water on the work. The upper and lower arms of each set rotate in opposite directions; the solution which is thrown from each thus strikes the work at an angle, so as to strip the dirt and oil from the surface. These revolving washing arms are the same as employed in the former models of washing machine made by the concern. The pump feeding the wash arm supplies 1,200 gal. of water per minute, and is driven by a 15-hp. motor. It can be seen along the side of the machine in the illustration.

Located at about 6½ ft. from the washing chamber are two sets of upper and lower revolving washing units that are equipped to throw 400 gal. of fresh rinse water or rinse solution per hour, so as to thoroughly clean the parts. A 3-hp. motor is sufficient to drive the pump for the rinse water.

When washing small objects, such as stampings and screw machine products, the parts are placed in racks made of wire mesh laid over pressed steel frames. Two racks 18x24 in. in size can be fed into the machine, side by side. They are carried continuously through the machine on the conveyor, so that they pass under both the washing and rinsing sprays. Larger parts can be placed in racks, which can be brought to and taken from the machine on conveyors.

"Duwell" Self-Guiding Scriber

A self-guiding scriber intended for the use of mechanics, particularly toolmakers, is being introduced by the J. A. Finley Co., Grinder Department, 20 Braintree St., Allston, Mass. The feature of this tool is the double point, as shown in the accompanying illustration, by means of which the operator is enabled to lay out an outline at the bottom of a small, irregular-shaped hole,



"DUWELL" SELF-GUIDING SCRIBER

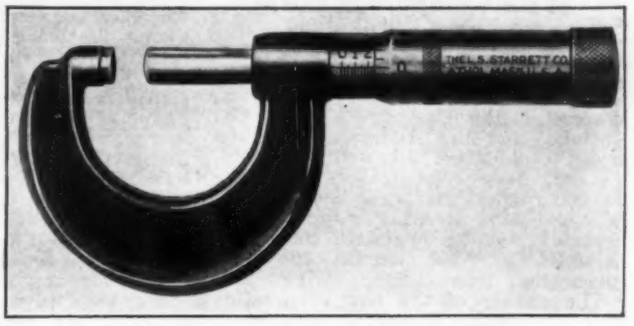
as in transferring or "setting-off" a punch blank from the finished die.

One of the points is made sharp to do the scribing, while the other one is slightly rounded and is a trifle shorter than its mate. The tool is introduced in a small hole by pressing the points together, and is then twirled between the thumb and fingers, the spring point causing the scribing point to follow the outline of the hole. For larger holes the single point at the opposite end of the tool is used in the regular manner.

Starrett 1-Inch Micrometer

The L. S. Starrett Co., Athol, Mass., has added to its line the 1-in. micrometer illustrated herewith and designated as No. 435.

The frame is drop forged and the ribbed section adds greatly to its rigidity. The finish is in black enamel. As the diameter of the screw is 0.312 in. and that of



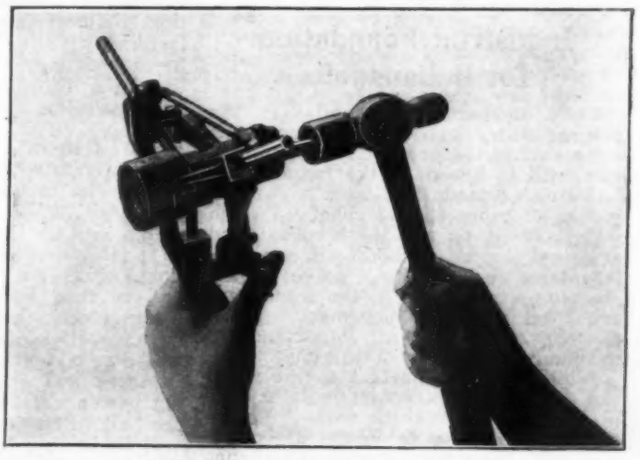
STARRETT 1-INCH MICROMETER

the contact points 0.270 in., large wearing surfaces, insuring long life, have been provided. Decimal equivalents are marked on the thimble. The micrometer can be furnished either with or without a ratchet stop.

"Duwell" Centering Device

A tool for center-marking round stock rapidly and accurately has recently been placed on the market by the J. A. Finley Co., 20 Braintree St., Allston, Mass., under the name of the "Duwell" centering device.

The hub of the device has a reamed hole through its axis to which is fitted a ground center punch. Extending radially from the hub are three steel posts, equi-



"DUWELL" CENTERING DEVICE

distantly spaced around the periphery, and upon each post is a sliding jaw. A bushing, or spider, having an equal number of radial bosses fits over the hub in such a way that it may be rotated without endwise movement.

Connecting rods join the radial bosses to the jaws upon the hub, so that when the bushing is rotated relative to the hub the toggle action of the rods causes the jaws to slide simultaneously inward or outward, according to the direction of rotation.

The illustration shows the manner of using the device. After centering, a light blow with a hammer on the outer end of the punch finishes the operation, leaving a mark exactly in the center of the bar.

News Section

Wire Companies Form Merger

According to reports received during the past week the Wire Goods Co., Worcester, the Cassady-Fairbank Co., Chicago, and the Andrews Wire and Iron Co., Rockford, Ill., and Waterford, Canada, have consolidated as a $1,000,000 corporation, with headquarters in Worcester. Eventually the business probably will be conducted under the name of the Washburn Co., the other corporation names disappearing.

The officers of the new corporation are: president, Charles G. Washburn; vice presidents, Arthur G. Andrews, Rockford; Perry M. Shepard, Chicago, and William L. Walker; treasurer and general manager, Reginald Washburn; secretary, Irving A. Green; directors, Charles G. Washburn, Reginald Washburn, Arthur G. Andrews, Perry M. Shepard and William L. Walker.

The business of the Wire Goods Co. was established in Worcester in 1880, and its growth has been large and steady ever since. In addition to the Cassady-Fairbank and the Andrews Co., the company has absorbed several other firms, including the Ayres Manufacturing Co., the E. Jenckes Manufacturing Co., Pawtucket, R. I., manufacturers of wire hardware, and the Woods-Sherwood Co., Lowell, the oldest concern in the country making kitchenware.

Industrial Foundation for Indianapolis

The trade in Indianapolis, at the present time, is becoming very much interested in the proposed formation of what will be known as the Indianapolis Industrial Foundation, with a capitalization of more than $1,000,000, which will be used to provide financial and advisory service to both old and new industries in the city. Some of the most prominent men in the trade here are backing the movement, which promises to be of vast importance to the industrial health of the city.

While not so important to the retail end of the trade, the fact remains that in order to further the cause, the retailers are coming forward almost in a body with their moral and financial support toward the formation of the organization.

The Foundation will be sponsored by the Indianapolis Chamber of Commerce and will function through the Bureau of Industries of that body. It is the intention of those behind the movement to create such a large reserve fund in the capital stock issue that industries may be aided financially at a nominal rate of interest, when an investigation of the organization, its product and its market area show that by the aid of capital and some good sound advice, the industry can keep its head above water. In this way the older industries of the city will be benefited as well as the new. One prominent man in the trade here said when talking of the wholehearted support the trade was giving the movement, that it was the intention to keep failures in Indianapolis down to a minimum. He said many failures were due to lack of financial assistance at the right time and also lack of proper co-operation on the part of other executives who might have the solution of that particular problem if they were appraised of the situation. It is planned to make the foundation self-sustaining through the rate of interest charged.

Steel Treating Society Expects Record Attendance at Detroit Convention

Final arrangements are being made for the fourth International Steel Exposition and Conventions of the American Society for Steel Treating and the American Drop Forging Institute to be held in the General Motors Building, Detroit, Mich., Oct. 2-7.

The exposition will be the largest ever held, as 99 per cent of the floor space has been sold and many exhibitors who desired to be present will be unable to be accommodated. There will be quite a number of exhibitors who have not been present at previous shows due to the fact that the Drop Forging Institute is holding its Annual Convention simultaneously and in the same building with the American Society for Steel Treating, and many members of the Drop Forging Supply Association are accepting the opportunity to exhibit.

The General Motors Building is especially adapted for exhibition purposes. In the large exhibition hall, there are 30,000 sq.ft., while the two wings on the same floor leading to the exhibition hall has 20,000 additional square feet of display space. All but a few booths have been sold. Arrangements have been made so that in one section of the hall gas furnaces will be in operation, while electrical furnaces and other equipment requiring power will be displayed throughout the hall. Practically all of the exhibits will be in operation. With Detroit as a steel market an attendance in excess of 15,000 is expected.

The railroads have granted fare and one-half for the round trip to Detroit on account of the conventions. In order to be able to take advantage of this reduced fare which applies not only to the holder of the certificate but to the members of his family as well, it is necessary that one should have an identification certificate. These may be obtained by addressing the National Secretary of the American Society for Steel Treating, Mr. W. H. Eisenman, 4600 Prospect Avenue, Cleveland, Ohio. Reduced fare tickets may be purchased from September 28, return limit being October 13th.

Philadelphia Industrial Conditions

According to statistics compiled by the Metal Manufacturers' Association of Philadelphia, a further improvement during July is revealed, the 132 plants canvassed having added 1,084 employees to their payrolls during that month. This was an increase in employment of 2.3 per cent compared with the month of June, bringing the numbers employed to 48.1 per cent of what they were in the same shops in July 1920. Group No. 1, the shipbuilding industry, is now employing 21 per cent of the employees that were on their payrolls in July, two years ago, while Groups 5, hardware and plumbers supplies; Group 6, auto and accessory manufacturers; and Group 11, miscellaneous industries, have approximately 80 per cent of the number of employees that they had two years ago.

There is very little change in the average weekly operating week though the tendency seems to be to a slightly longer week, which may be more evident after the summer months are over as a few companies make it a practice during the hot months to operate only five days a week.

No wage reductions have been reported since February and it is very unlikely that there will be any within the next few months unless there is some radical change in conditions which cannot now be foreseen. It is more probable that the tendency is toward slight increases to be granted to individuals on the basis of their production and ability.

It is not unlikely that the building trades which have utilized much of the common and semi-skilled labor will demand fewer additional workers in the future, and toward fall this should be felt in an easier market for common labor especially, as it usually is.

The Midvale Steel and Ordnance Co. made a wage increase on Aug. 1 from 25c. to 28½c. per hour for common labor at its plants at Johnstown, Pa.

Alabama Pig Iron Output Increased in July

Official figures on pig iron production in Alabama during July give the tonnage at 194,300, almost three times the production of July, 1921, in which month 66,573 tons were produced. In June, of this year the production totaled 189,008 tons, showing a steady upward movement each month since the first of the year. With more furnaces now operating in the district than at any time in the past two years, August production is expected to be around 215,000 tons in spite of the railroad strike which is retarding operations slightly. There were 22 blast furnaces in operation during July, as compared with five in July of last year. The pig iron market holds firm at around $20 to $20.50 for No. 2 foundry iron.

Labor and Wage Conditions in Austria

The Workman and His Status—Position of Labor Unions—Health, Accident and Life Insurance Compulsory

BY A CORRESPONDENT IN VIENNA

CONDITIONS under which the Austrian workman performs his work are largely governed by federal laws. His safety is a matter of Austrian federal legislation. In fact such questions as life insurance, sick benefit, pensions and working hours are all fixed by law. The question of wages is settled between the factories or other employers and the labor unions, who are very strong in the country. Where the workman lives in a company owned house the federal law makes certain provisions, but otherwise leaves matters to local authorities.

Just now the Austrian workman is living in the "silk shirt era" as it was called in America. He does not literally buy silk shirts and automobiles, as they are in most cases more expensive than in America, but he throws his money away on other luxuries. Formerly the workman was satisfied if he could have a place to live, buy three meals a day and put something aside for a rainy day, but that time has passed. Now he drinks wine instead of beer. He buys fine clothes. He spends a lot of money at the candy shops and confectioners. He has better meals than formerly, but he saves nothing, which, however, is easy to understand.

ERA OF FREE SPENDING

Saving money in Austria in these days is out of the question for the average person. If one deposits a certain sum of money in the bank today it may be worth only half as much 30 days hence, because of the steady depreciation of Austria currency. For instance, early in June it took 10,000 kronen (Austrian crowns) to equal one dollar. By the middle of July it took 35,000 crowns to equal one dollar. In other words, a given sum deposited early in June, depreciated in a little over a month to a point where it was worth less than one third. The only possible way for people to put aside money and not have it become worthless is to buy stocks and bonds, although even this method of saving is far from safe. Most people, including the workmen, either spend their surplus funds or buy useful articles before the currency goes down and the price of the goods goes up.

The scale of wages for the workman is a sliding one. If the crown falls in value, the wages go up, although they do not keep pace one with another. The wages are always two weeks or a month behind nothwithstanding the fact that each factory has clerks doing nothing else but correcting the scale of wages. On July 18, 1922, the scale of wages for metal and rubber workers averaged 400,000 crowns a month. These two classes constitute about the highest paid workmen. The sum of course sounds enormous, but expressed in dollars it was only about $12.00 per month. The unions fix the scale of wages and do not allow a good workman to be paid a higher hourly rate than a poor one, so the factory management endeavors to give the good workman the best paid work. In this way the objections to a fixed scale of wages is largely overcome.

In connection with the labor unions it is interesting to note that they are both a labor an a political organization. The workmen are all socialists and formerly controlled the government absolutely, but in the reecnt elections a more conservative and capable government was elected by the Christly-Socialist Party. Communism among the workmen seems to be a thing of the past. Vienna, with a population of 2 million inhabitants and the largest industrial city, formerly had quite a few communists among the workmen, but they have all since been thrown out by the men themselves. This is true of most industrial centers of Austria, although in the Wiener-Neustadt district there is still a great deal of radicalism. However, the Austrian workman, in general, is a good natured, intelligent individual, who is not given to radicalism, although he calls himself a socialist and, without exception, belongs to a labor union.

Safety regulations and appliances are required by law and are very strict, but, as is the case with American workmen, the men themselves often do not observe them. Such things as guards over exposed gears or chains are to be found on all machine tools. Large driving belts, such as are used to operate tin plate rolling mills, are enclosed and in every possible way the safety of the workman is provided for. Where necessary, the men are provided with goggles or masks, but as a rule it is hard to make them wear such articles. When, however, a workman is injured in a factory, the case does not go to court, because the insurance takes care of accidents and definite amounts are allowed for various injuries. This avoids litigation which is often expensive for the employer, workman, or both, to say nothing of the hard feeling it creates, and everyone knows what to expect, if a given accident occurs. The question of how an accident has happened has nothing to do with the amount paid, provided the manufacturer has lived up to the law regarding safety appliances.

INSURANCE COMPULSORY

The workman must take out both sick benefit and life insurance. His employer pays one-third and he pays two-thirds of the premium. This is deducted from his pay. Any taxes, such as income, are also deducted and paid to the state by the employer. If a workman becomes incapacitated for work through age or any other reason he receives a pension from the state, but it is so small at present that he would starve to death without any other source of income. During his period of employment each workman receives free medical attendance and if, necessary, all his hospital expenses are paid by his employer.

Welfare work as developed in the United States is not popular with factory owner or worker. A workman's council handles all matters which may arise between the factory management and the men, whether they involve individuals or groups of employees. Should a given workman have a grievance of any sort he must lay it before his council. The council decides whether the grievance is justified and, if so, lays the matter before the factory management. Questions of a collective nature are handled in the same way. This method of handling disputes has been found satisfactory by both sides.

EFFICIENCY IS IMPROVING

To provide suitable midday meals, the factories operate lunch rooms and cafes which, needless to say, are operated at a loss. The patronage given these places is very large because it is the most inexpensive way to secure a satisfactory meal. The management does not furnish entertainments during the noon hour, but in many instances places an auditorium at the disposal of the workmen. The men themselves furnish and pay for the amusements, which range from music rendered by their own band to that of famous opera singers and include other forms of entertainment. The present day audiences at the opera in Vienna could learn a great deal regarding silence and general good behavior from the workmen. Children's playgrounds, day nurseries, and visiting nurses are all provided, not by the factory management by by the workmen themselves and this method of welfare work has proven most satisfactory. The workmen do not feel that the management is always "butting in" on their own affairs, yet the same benefits are obtained without a certain paternalism on the part of the employer.

The eight-hour day and the forty-four week are universal in Austria and even extend to the stores and shops. In the steel industry also the eight-hour day is used and has been found perfectly satisfactory. The efficiency of the workman is much higher than in the period immediately after the war, but has not reached the pre-war standard. The Taylor and other similar systems have aroused a great deal of interest and factory managers have given them a great deal of thought.

According to a law recently passed an individual receives 80 per cent of what he would get if he were employed at his trade. This law was obtained by the socialists in return for their help in passing the new financial reorganization laws.

In conclusion, it might be said that most plants are operating at from seventy-five per cent to one hundred per cent of their capacity and that the workmen are causing little or no trouble. Should, however, the value of the Austrian currency suddenly increase, the factories will be unable to export their products and widespread unemployment will ensue. What result such a condition would bring about no one is willing to state, but all believe it would cause a revolution.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York
(Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

YELLOWSTONE PARK, Aug. 20.

I wish that all Americans might travel the route that brought me here. It traverses Minnesota, North Dakota and Montana, where the wheat grows and the people are receptive to new ideas, both political and economic. In so far as business conditions are concerned the feeling is aggressively optimistic. The crops are good, credit is readily obtainable and every one is looking forward to an autumn of activity and prosperity. There is, however, some dissatisfaction at the low price at which wheat is selling and the probability is that a large portion of the year's yield will be held in the hope of an advance and because it is becoming plain that the railroads cannot move it promptly. In this holding movement the War Finance Corporation is assisting by promising large loans to the various co-operative associations that have been formed among the farmers.

A coal famine this winter is generally and indignantly expected. The settlement adopted at Cleveland will add only about a million tons weekly to the present output and though it undoubtedly will be extended to many other fields probably several weeks will elapse before production gets much above 6,000,000 tons. This is less than consumption, whereas at this time of the year at least 4,000,000 tons weekly should be moving into stocks.

The local newspapers, including the Chicago *Tribune*, are encouraging the belief that the coal strike and the delay in settling it were successive steps in a plan deliberately designed to mulct the public by raising the price of coal. For this the coal mine operators and the Government, which has permitted the profiteering alleged, are held responsible, and it is, I think, almost certain that the displeasure felt will be vigorously expressed at the autumn election.

In North Dakota an effort is being made to strip some of the lignite coal beds that the state possesses in time to provide fuel for the coming winter, but success is doubtful and even if the railroad strike should be settled immediately and if the Cleveland settlement should be extended to the fields from which the Lake traffic is supplied it will be exceedingly difficult to provide the Northwest with the fuel it needs before cold weather sets in.

Meantime and despite the fact that the railroads have put many clerks and station hands at work in the shops the rolling stock is manifestly deteriorating and getting in bad shape to handle the traffic that is offering and accumulating. Car loadings, with the exception of coal, are very close to records, and as coal production increases movement of other goods will be handicapped. The surplus of freight spells prosperity for the railroads, but the deficiency of transportation will restrain autumn industrial activity, and we cannot dismiss the effects of the strikes from our calculations as soon as they are over.

One of the officers of a large bank serving this region told me that he was selling out all the Liberty Bonds and Treasury Certificates that he held that he might be prepared to meet the demand for money that would be caused by an inevitable freight blockade, and that he knew that several other bankers were doing likewise.

But the prospective railway congestion and coal scarcity are the only shadows that bedim the sunshine of optimism and prosperity in this section, and as often happens it may be that their effect will be less serious than expected now that they are being vigorously prepared for.

The prices which producers are receiving for their crops, and for their wool, livestock and hides, are on the whole higher than a year ago. Whatever is lacking in Western buying power will be made up in the South, and trade during the New Orleans Fall Buyers' Week has been extraordinarily good. Undoubtedly in many sections the bludgeoning of deflation was so severe that the farmer has not yet recovered, but, to quote an Iowan, "The West is neither broke nor blue," and the improvement in the mail order and automobile businesses is an indication that the 50 per cent of our purchasing power represented by the rural districts intends to give a good account of itself.

The commodity markets have shown a general downward trend all week. As usual this is ascribed to specific influences in each market, but the probability is that the prevalent optimism had discounted business improvement a little too rapidly. In sugar the almost miraculous disappearance of the surplus started everyone talking about a shortage, whereas there is still a plentiful supply, and the too rapid advance in prices has been followed by a decline. Coffee is dull and unsteady because the trade is afraid Brazil will depress the market by selling some of the stock she has been withholding. Rubber, under pressure of a surplus such as there was in sugar six months ago, has dropped to a new low record. Cotton is sensitive to unfavorable foreign news one day and to crop killing dispatches the next. It has never regained the peak it reached on the August 1 report and the chief influence in the market seems to be the fear of mill men that they will not be able to sell goods at a profit when the cotton in them costs more than 20 cents.

Hides have reacted a little after their steady advance, but wool is still strong and despite the occasional pessimism which has been noticeable in the woolen goods trade the American Woolen Co. has easily sold all the material it can manufacture. Petroleum and its products, of which huge stocks have been accumulated, are weak.

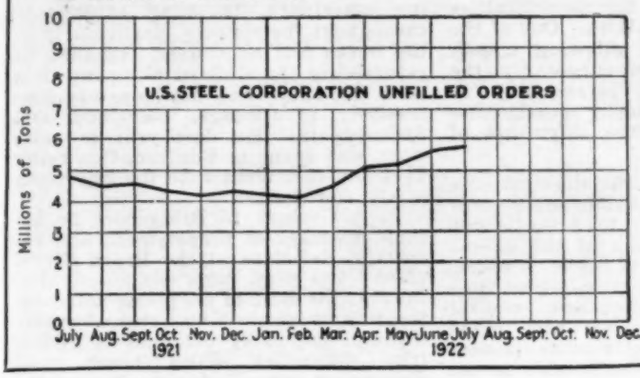
Most industries are beginning to feel the effects of fuel shortage. Iron and steel output has been further curtailed and probably will decline still more, and the Detroit automobile manufacturers, who have been making astonishing records in production and sales, say they will have to stop work entirely unless coal is soon available. From some of the chief industrial centers is reported a scarcity of skilled labor, which may become more aggravated later in the fall.

Stocks and bonds have been sluggish but firm, and railway bonds have made new highs. While credit is abundant and industrial and trade confidence persists there is no reason to expect any setback. The changes in the Federal Reserve System's report for the week were unimportant. Gold holdings declined and the reserve ratio was slightly lower at 80.2 per cent. The Kansas City and Minneapolis banks, in the grain districts, have cut their rediscount rates to 4½ per cent, but the reserve banks have voted overwhelmingly against a proposal to establish a special rate of 3½ per cent on agricultural paper.

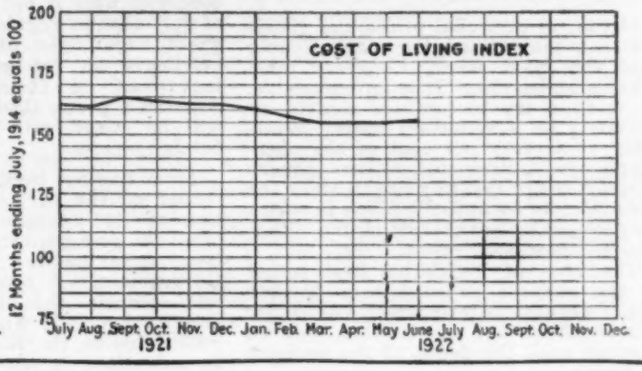
The thirteenth conference of the Allies on German reparations broke up last week without accomplishing anything and the mark declined until on Thursday a thousand could be bought in New York for 95 cents. Except as it represents faith that Germany will pull out, or be helped out, of the financial mire, the mark is worthless. The people seem to have work to do and enough to eat, but their surplus production is practically confiscated to pay reparations and not enough of it can be used to buy food and raw materials. Her industry cannot permanently function on such a one-sided basis. Left to herself, with ability to trade her surplus for the things she needs, Germany might go on as Poland is, and improve her agricultural and industrial position despite financial demoralization. Unless she obtains at least the aid of a moratorium her case would appear hopeless. This seems so apparent that it is my chief reliance in predicting that a way will be found to grant it.

Many Senators have invited their political destruction by putting through a highly sectional tariff which there is no doubt the American people do not want. How much harm it, and the soldiers' bonus and ship subsidy if they should be passed, will do to business can only be guessed at present. Meantime not even strikes and high taxes can keep the wheels from revolving and though they creak and jerk a little they are likely to move with increasing smoothness during the autumn. Confidence prevails that strike troubles will be settled soon and in all quarters there is to be found optimism for the future. A clearing of European skies will give added stimullus.

Unfilled orders of U. S. Steel Corporation based on the monthly reports showing the forward tonnage on the books at the end of each month.



Index of the Cost of Living based on weighted retail prices collected monthly and compiled by the National Industrial Conference Board.



DIVIDEND disbursements by industrial companies to stockholders in September, according to forecasts just made, will amount approximately to $37,400,000 a slight decrease as compared with the corresponding month of last year. This brings the total dividend disbursement by industrial companies for the current year to date to $388,700,300. Steam railroads will pay out $14,750,000 while street railways will disburse $3,025,000, a grand total of $55,175,000, as compared with $56,200,500 paid out by companies in these three classes in 1921. Interest payments will aggregate $180,600,000.

British living costs, according to the index figure for July just announced by the Labor Ministry, is 81 above the pre-war level, a drop of three points from that of June. British unemployment figures, though still bad, show a further slight improvement. The number of unemployed on July 31 is given as approximately 1,400,000 as compared with 1,455,000 at the end of June.

Cost of food and other commodities, wholesale and retail, in the United States, took an upward jump during the month of July, retail prices averaging a 1 per cent increase, while wholesale prices registered a gain of about 3¾ per cent as compared with June prices. Comparison of wholesale prices in June with those of a year ago indicated, the department said, that the general price level had advanced about 10 per cent, with fuel and lighting materials registering an increase of 36½ per cent. The average retail price is based on forty-three items in fifty-one cities.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

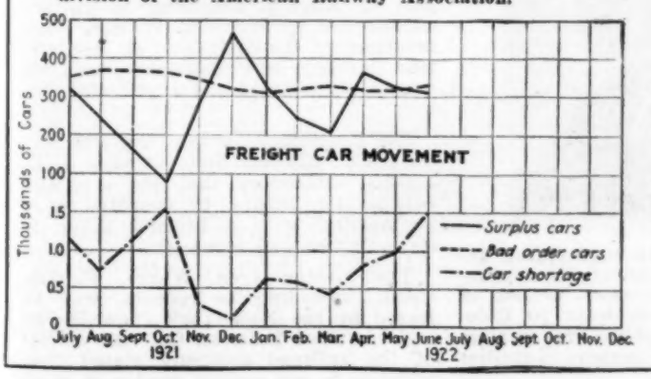
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0273	$0.0252	$0.0278
Cold finished shafting	per lb.	0.0365	0.0335	0.0428
Brass rods	per lb.	0.165	0.1550	0.159
Solder (½ and ½)	per lb.	0.22	0.213	0.18
Cotton waste	per lb.	0.11	0.11	0.122
Washers, cast iron (½ in.)	per 100 lb.	4.00	3.83	4.06
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.11	3.11	.....
Lard cutting oil	per gal.	0.575	0.575	.....
Machine oil	per gal.	0.36	0.36	.....
Belting, leather, medium	off list	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65–10%	50%@ 60–10%

Surplus freight cars—that is, cars in good repair and immediately available for service if transportation conditions warranted—totaled 174,927 on July 31, or a decrease of 28,395 cars since July 23. Surplus coal cars stood at 131,267, a decrease of 10,163 within that period. There was a reduction within the same time of 13,778 in the number of surplus box cars.

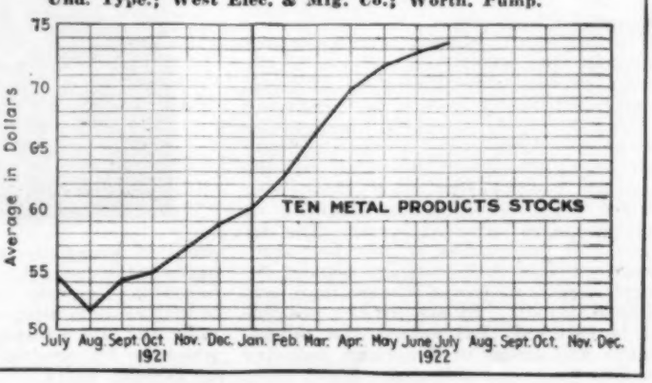
Steel ingot production in July according to the reports issued by the American Iron & Steel Institute, showed a decrease of 147,373 gross tons for 30 steel plants which produced 87½ per cent of the total in 1921. This is the second month of the current year to show a decrease, June production having dropped off 76,664 tons. July production totaled 2,487,104 tons, bringing the tonnage for the current year to date up to 15,986,490 as compared with 16,826,946 tons produced during the entire twelve months of 1921.

Loadings of revenue freight on American railroads for the week ending August 5, totaled 851,351 cars as compared with 859,733 in the week previous. Compared with the corresponding week of last year there is an increase shown of 65,173 cars, but the figure shows a decrease of 84,379 as against the same period of 1920. Coal loadings increased 2,872 cars over last week but decreased 66,849 cars as compared with 1921.

Monthly average of car shortage, surplus and bad order cars in the United States based on returns to the car service division of the American Railway Association.



Monthly average: Ad. Rumely; Allis-Chalmers; American Can; Cent. Can; Gen. Elec.; Int. Harv.; Nat. Acme; Und. Type.; West Elec. & Mfg. Co.; Worth. Pump.



Washington Notes

BY PAUL WOOTON

If control over coal prices and distribution is maintained, Secretary Hoover said this past week, Congress must provide legislation. It is impracticable, he said, to try to continue control indefinitely on a voluntary basis. While sixty or seventy per cent of the operators are willing to do the square thing, it is not fair to them to allow the remainder to occupy a position in which they can take advantage of the situation to their own profit.

The type of legislation best suited to the purpose has not been worked out. Several alternatives are under consideration but no decision will be reached until the depth of the problem is known.

In discussing the extent to which the coal operators had co-operated with him in the control of prices and distribution, Secretary Hoover said that he had been given 100 per cent co-operation in the smokeless field with almost as good performance in Virginia and parts of West Virginia.

Advices reaching Washington are to the effect that British coal arriving in New York is not finding a ready market. It also has been found that no coal rates are in effect on the railroads from New York to inland points.

Wide publicity has been given a news article to the effect that Commerce Secretary Hoover has endorsed the metric system. Secretary Hoover states that he is at a loss to understand how such a report originated. He has not endorsed the compulsory use of the metric system, he says.

Establishment of foreign trade zones at a number of American ports practically is assured by the action of the Senate on Aug. 16 in adopting, with practically no opposition, an amendment to the tariff bill which would authorize the creation of such zones. The plan for the so-called freeports has been denounced by ultra-protectionists as a free-trade scheme. To meet some of the objections voiced against the proposal, the Senate committee eliminated from the original amendment the authority to establish manufacturing enterprises within the free-zone. It will be possible, however, to store, exhibit, break-up, repack, assemble, distribute, sort, refine, grade, clean, mix, and otherwise manipulate foreign or domestic merchandise in an area where no compliance with the laws and regulations governing the entry of merchandise will be required.

Under existing law any goods landed in this country must pass through the Custom House. If they are re-exported 99 per cent of the duty paid is refunded. In addition to the loss of one per cent of the duty, there is the more important consideration of vexatious and costly delays in complying with the red-tape which accompanies entry through the Custom House and the subsequent dispatch of the foreign goods after they have been mixed with domestic merchandise or assembled in different forms. The delays and annoyances of this procedure were such as to discourage almost entirely any handling of foreign merchandise in transit. By making this possible it is believed that substantial advantages will ensue to American industry and to American shipping. Many ships come to the United States in ballast, it is declared, which would bring cargoes for trans-shipment to various other countries were it not for the difficulties of our customs regulations. One of the great advantages of allowing transit privileges on foreign cargoes is the fact that on their re-assembly at American ports, domestic merchandise will be mixed with the shipments of foreign origin.

There has not been the slightest surrender on the part of the administration of its intention to bring about practical reorganization of the executive departments of the Federal Government. A tentative report was laid before the President several months ago. It has not been made public due to the fact that the report as submitted is not acceptable to all the department heads. It is believed, however, that certain changes in the plan can be made so as to secure for it the unanimous support of the department heads or at least any dissenting opinions that may be offered will be of minor importance.

Were the report to be sent to Congress without the endorsement of certain of the department heads, it is recognized that the possibility of securing the legislation would be lessened. Moreover the legislative situation, since the report was submitted to the President, has been such as to preclude action on reorganization. In addition if the report were made public in its tentative form and before unanimous endorsement by department heads has been secured, there is a feeling that it would invoke non-constructive criticism and arouse agitation which would serve no good purpose.

It can be stated authoritatively that the reorganization proposal has not been laid aside indefinitely.

Frank Burr Smith Dead

FRANK BURR SMITH, works manager of the Bullard Machine Tool Co., Bridgeport, Conn., died Aug. 16th, as the result of an acute attack of appendicitis. Born in Fairfield in 1872 and educated in Bridgeport, he entered the employ of the Bullard Machine Tool Company in 1890 as a machinist apprentice, going to the engineering department on completion of his apprenticeship. Leaving in 1894 because of bronchial difficulty, he went to Colorado and did prospecting and mining, which he followed in various capacities for several years.

In 1903 he joined the De La Vergne Machine Company as engineer for the installation of their refrigerating machinery, traveling extensively throughout the country, particularly in the South and Southwest. In 1911 he returned to the Bullard Company in a sales capacity with headquarters successively in Chicago, Cleveland and Philadelphia. His last year in sales work was spent in England, this being 1914 and coincident with the beginning of the world war.

On his return to Bridgeport he became manager of Employment and Industrial Relations at the Broad Street plant. His work here was so successful that the Bullard shop was noted for the way in which it was steered safely through the rocky channels of industrial difficulties which beset most Bridgeport manufacturers during the war years. Frank Smith had the personality, the vision and the knowledge of human nature which made his dealings with men of all kinds successful from every point of view.

With the moving of the Bullard shop to the Black Rock plant in 1920 he became works manager, occupying the position until his death. Mr. Smith was also active in the mechanical development of Bullard products and he also patented a number of mining and automotive devices. He was a member of the Algonquin Club and also of the Masonic order. He leaves a widow and brother as well as a host of friends who will miss his genial welcome at the Bullard plant.

Business Items

The Ohio Electric and Controller Co., Cleveland, Ohio, announces the appointment, effective September 1, of C. J. Pagel, as sales representative. Mr. Pagel has been associated with the Robbins & Myers Co. in the Cleveland district.

The Ohio Electric and Controller Co., Cleveland, Ohio, announces the appointment of Paul H. Diver as manager of sales. Mr. Diver has been associated with this company four years as sales representative.

The Atlantic Coast Line Railroad Co., Savannah, Ga., will enlarge its Southover machine shops, the present plan being to invest about $100,000 for this purpose, including new equipment and improved machinery.

The Elliott Co., Jeannette, Pa., manufacturer of power accessories, will open a branch office in Atlanta in the latter part of August, according to an announcement by James E. Watson, vice-president of the company. H. A. Hoffman, formerly of Philadelphia, has been named manager for the Atlanta district.

The Loshbough-Jordan Tool and Machine Co., Elkhart, Ind., through J. C. Jordan, announces that the company will, in the future, be operated as a partnership with a broader scope to its activities and interests.

The Groton Iron Works, Groton, Conn., according to reports, will be leased by the New York, New Haven and Hartford Railroad Co. An official of the railroad company stated that inability to get certain grades of work

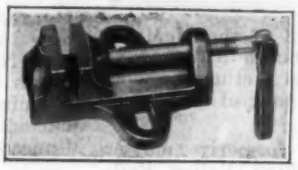
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Vise, Drilling Machine

J. L. Austin Manufacturing Co., 419 Van Buren St., Milwaukee, Wis.

"American Machinist," May 4, 1922

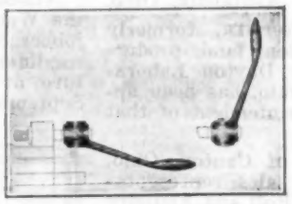


The vise is used in place of special jigs and fixtures for quickly securing small parts which require drilling. It is made of cast iron and has two flanges on the base for attachment to the table of the drilling machine. The handle is so secured to the end of the operating screw that it can be swiveled for operating in cramped positions. The jaws are 3 in. wide and 1⅛ in. deep, and open 4 in. The ¾-in. screw has an Acme thread. Weight, 10 pounds.

Handle, Vise

Bentley & Holmgren, 406 Court Exchange Bldg., Bridgeport, Conn.

"American Machinist," May 4, 1922



The vise handle is used for positioning the movable jaw of a screw-type milling machine vise, as the ordinary handle sometimes interferes with the table or the setting. The handle has two square holes at right-angles to each other in the boss. When the handle is applied in one position, as shown at the left, it clears the table and can be revolved. Applied as shown at the right, it gives a long lever to tighten the screw. The handle is made in a range of sizes, having holes from ⅜ to ⅞ in. The smallest size has a 1¼-in. radius of swing with the short leverage, and a 5-in. radius with the long leverage. The swings of the largest handle are 2⅞ and 9½ inches.

Drilling Machine, Upright, Automatic, Duplex, "Autoplex"

H. Edsil Barr, Erie, Pa.

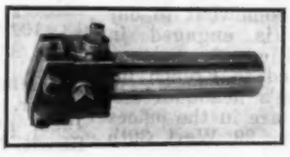
"American Machinist," May 11, 1922

The machine is intended for high-speed drilling, reaming, facing and polishing, drilling automatically and dropping the parts into a chute. Two spindles, mounted on the face of the column, each rotate in a square guide block or quill and are driven by a three-step pulley. The feed and the work chuck are operated by a five-step cone pulley at the rear. Each fixture head is removable, has four pockets to hold the work, and can be adjusted vertically by the handwheel beneath it. The work is usually carried on a sheet-metal container, and the operator feeds one head with each hand. Drills or reamers up to ⅝ in. in size can be handled.

Cutter Holder, Angle, Adjustable

Warner & Swasey Co., Cleveland, Ohio

"American Machinist," May 11, 1922

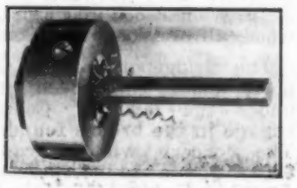


With the device cutters can be adjusted to limits as small as 0.0005 in. A graduated adjusting screw operates a small cutter slide. The lock screw is ordinarily drawn up lightly and kept in that position, so that the adjustment can be made without changing the tension of the screw. The exact size of the work can be maintained as the cutting edge wears down and as the machine warms up.

Die, Screw-Cutting, Two-Part, "Reliable"

Conant & Donelson, Conway, Mass.

"American Machinist," May 4, 1922

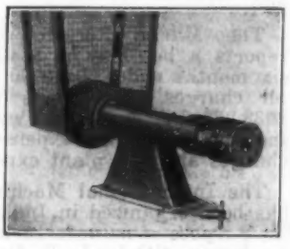


The die is made in all commercial sizes from ⅛ in. upward and fits the same collets that the corresponding sizes of the regular product fit. The special feature of the die is the way in which the face is ground to curl the chips ahead of itself, instead of allowing them to fill and clog the clearance spaces. This is accomplished by undercutting the edges in a sharp diagonal.

Headstock, Lathe, Lapping and Filing

Marvin & Casler Co., Canastota, N. Y.

"American Machinist," May 4, 1922

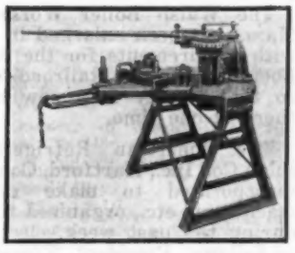


This lathe headstock is used when lapping and filing small parts. It is shown equipped with a guard for the driving belt. The headstock is fitted with ball bearings at each end of the spindle. It may be equipped either with a twin-screw drill chuck or a three-jaw chuck. The base of the headstock is 10¾ in. long, and the distance from the pulley to the drill chuck is 14⅝ inches.

Bending, Forming and Shearing Machine, Universal

Bussel Machine Co., El Paso, Texas

"American Machinist," May 11, 1922



The machine is hand-operated and furnished in three sizes, the smallest size being intended for bench mounting. The medium sized or No. 2 machine has only one bending post and no shearing plate or compound ratchet; but the No. 3 size, as illustrated, is equipped for forming and shearing and has a compound ratchet lever and two bending posts for light and heavy work. No extra dies are required. The machine operates either right- or left-handed. Bending capacity of No. 3 model: small post, cold ¼ x 6 in. and ⅞-in. round or square steel, and hot ⅝ x 6 in. with a sharp corner; large post, cold ⅝ x 6 in., hot 1 x 6 in. with a sharp corner, and 1⅛ x 6 in. with a round corner, and pipe up to 2 in. in diameter. Weight, 840 pounds.

Belt Shifter, Automatic, "Kleckler"

Keuka Industries, Inc., Hammondsport, N. Y.

"American Machinist," May 11, 1922

The device is for use on all machines operated by belts running on cone pulleys. The belt does not slacken to a great extent during the shifting, and only one hand is necessary to operate the device. A loop fits the belt at both the countershaft and the machine pulley, and is so pivoted that its sides remain parallel with the belt for all movements. Near each end of the mechanism is a weighted pendulum pivoted to the outer ends of the belt actuating levers. Belts from 2 to 5 in. in width on any standard machine can be handled, and the device can be applied to most lathes by securing it under the rear cap bolts. For long and heavy belts, heavier pendulums are provided.

done at repair shops is a prime factor in the move. The railroad plans to employ between 600 and 800 men at the Groton plants.

The Thomaston Knife Co., Thomaston, Conn., has recently been incorporated under the laws of Connecticut, to manufacture cutlery, small tools, hardware, etc. The capital stock of the company is $60,000, and the incorporators are: Howard S. Hitchcock, J. W. Wedgewood and Florence Wedgewood, all of Woodbury, Conn.

The Bridgeport Bronze Co., Bridgeport, Conn., has been incorporated under the laws of Connecticut, to engage in the bronze foundry business. The concern will be capitalized at $200,000, and the incorporators include: Jonathan Grout, 1115 Main St., Bridgeport; Howard L. Schaff and Hilda M. Trainor, also of that city.

The Delaware, Lackawanna and Western Railroad Co., one of the railroads which depends to a large degree upon the movement of coal for its revenues, reports a June gross of $5,501,267, a drop of $2,064,865, compared with the corresponding month a year ago.

The Marlin Rockwell Corporation reports a net loss of $34,480 for the six months ended June 30, 1922, after all charges. The gross income was $938,968, but deductions were $973,449, including general expenses, interest charges and idle plant expenses.

The International Machine Tool Co. has been organized in Indianapolis for the purpose of manufacturing tools and machinery. Orlando B. Iles, president of the Indianapolis Chamber of Commerce, and a well known manufacturer is one of the organizers. Among the others are Esther D. Iles and T. F. Dickinson. The company will have a capital stock of $45,000.

The Walsh Boiler Works, Holyoke, Mass., has been enlarged in accordance with requirements for the repairing of Boston and Maine Railroad locomotives, so that twenty may now be repaired there at one time.

The American Refrigerating Machine Co., Inc., Hartford, Conn., recently incorporated to make refrigerating machinery, etc., organized the company during the past week, electing officers as follows: President, Edward Carlson, West Hartford, Conn.; vice-president and general manager, Eric S. Sandberg, 35 Brown Street, Hartford Conn.; secretary and treasurer, Joseph H. King, also of West Hartford.

The Clifton Manufacturing Co., Newark, N. J., has filed notice of organization to operate a plant at 189 Market Street, for the manufacture of radio equipment and parts. The company is headed by Charles B. Whipple.

The Van Dresser Brothers, 1157 Concord Ave., Detroit, Mich., announces that the sale and distribution of Van Dresser cylinder reboring tools, until recently handled by the International Purchasing and Engineering Co. of that city, will, from now on, be handled direct by themselves.

The Remington Cutlery Works, Inc., Barnum and Seaview Aves., Bridgeport, Conn., recently incorporated with a capital stock of $1,500,000 under the laws of Connecticut, to manufacture cutlery in all its branches, organized the past week by the election of the following officers: President, C. L. Rierson, Bronxville, N. Y.; vice-president, I. S. Betts, New York City; treasurer, Charles W. Many, West Brooklyn, N. Y., and secretary, George Bingham, Plainfield, N. J.

Personals

GEORGE E. TITCOMB of the McMyler Interstate Co., 50 Church Street, New York City, has just returned home from a five months' tour of inspection of European ports.

A. L. ROBERTS, formerly master mechanic of the Lehigh Valley Railroad and more recently chief engineer of the Atlas Crucible Steel Co., Dunkirk, N. Y., has been appointed sales engineer of the railroad department of the United Alloy Steel Company, Canton, Ohio.

SEVEREN P. KERR, JR., identified for the past two years with the Sharon Steel Hoop Co., Sharon, Pa., has been made general manager of sales of the Ashtabula Steel Co., Ashtabula, Ohio.

GEORGE T. CHRISTOPHER, formerly assistant superintendent and production manager of the Dayton Laboratories Co., Dayton, Ohio, has been appointed general superintendent of that company.

SAMUEL F. LONG, of Canton, Ohio, has been appointed sales representative of the National Roll and Foundry Co., Avonmore, Pa.

JOHN F. KALK, formerly with the Dunham Co., Berea, Ohio, and for the last three years superintendent of the Muskegon Castings Co., Muskegon, Mich., has been appointed superintendent of the Eagle Foundry Co., of Muskegon.

THOMAS STEWART, until recently with the Inter State Foundry Co., Cleveland, has just been made superintendent of the Muskegon Castings Co., succeeding John F. Kalk.

ARTHUR WHITCRAFT, manager of steel sales, Hadfield-Penfield Steel Co., Bucyrus, Ohio, in addition to his previous duties has also been placed in charge of all foundry operations at the south works of the company, Bucyrus, Ohio.

HARRY W. HULTGREN, salesman for the Skinner Chuck Co., New Britain, Conn., resigned his position Aug. 1.

M. A. ANTOINE of France, engineer of roads and bridges, is in this country on a mission relating to the study of housing and building construction generally, and problems of industrial management. He represents the French Department of Public Works, the Comité Michelin, and the Association of French Contractors. The Comité Michelin corresponds somewhat to our Taylor Society and is engaged in studying the possibilities of efficiency management as applied to French industries. Mr. Antoine's headquarters, while in this country, are in the offices of the Taylor Society, 29 West 39th St., New York City.

JOSEPH PENDER, for a number of years past associated with the U. S. Steel Products Co., has been appointed sales representative of the Weaver Manufacturing Co., Springfield, Ill., manufacturers of garage and shop equipment, and will cover the States of Texas, Oklahoma, Arkansas, and Louisiana with the exception of the cities of El Paso and New Orleans. He will make his headquarters in one of the Texas cities at an early date.

DEL LANG, for the past five years associated with the Champion Spark Plug Co., has been appointed sales representative of the Weaver Manufacturing Co., Springfield, Ill., manufacturers of garage and shop equipment and will cover the states of Wisconsin, Minnesota, North and South Dakota and Illinois with the exception of the City of Quincy. He will make his headquarters at 3508 Eleventh Ave., South, Minneapolis, Minn.

W. CLAYTON FARRIS, for several years associated with the Horne Co., Ltd., of Japan and, for the past year, manager of the company's branch in Osaka, has recently returned to the United States to spend his vacation. During his stay in the United States he will make his headquarters at the New York offices of the company, 51 Chambers Street, New York City.

ALBERT J. WOODRUFF, president of the Woodruff Machinery Co., Atlanta, jobber of machinery and supplies, is a candidate for the Georgia state legislature at the primaries to be held in September.

Obituary

COLEMAN SELLERS, JR., president of William Sellers & Co., Philadelphia, died August 15th, after an illness of three months, in his seventieth year. An appreciation of his work in carrying on this pioneer machine tool building firm will appear in a later issue.

DAVID WADSWORTH, one of the leading manufacturers of central New York, died at his home August 15 at 74. He was head of the David Wadsworth and Son plant, manufacturing scythes and knives for agricultural implements. He was Alderman, Water Commissioner and twice Mayor of Auburn. His industry is one of the oldest in America, having been founded more than a century ago at Grafton, Mass.

GEORGE BICKNELL, secretary and treasurer of the Meriden Machine Tool Co., manufacturer of tools, etc., Meriden, Conn., died August 15 at his home after a long illness. Mr. Bicknell was well known in industrial circles throughout the east. He was born in Belfast, Maine, November 25, 1861.

THOMAS E. DEELEY of Robert Deeley and Co., maker of sugar refining machinery, New York City, died August 13, 1922, at his residence in the New York Athletic Club.

JAMES KENNEDY, engineer, editor and author, died suddenly on August 14th, 1922, at his home, 128 West 129th Street, New York City. He was at the time of his death editor and president of the Angus Sinclair Publishing Company. Mr. Kennedy was 72 years old. He learned the machinist trade and worked at locomotive construction and repair work while studying at night. He was in charge of the locomotive

shops of the New York Elevated Railroad from 1879 until 1902. Mr. Kennedy was chief cashier in the Water Department of the city in 1903 and deputy superintendent of elections in 1904. In the following year he became associate editor of *Railway and Locomotive Engineering*. He was made managing editor in 1910.

WILLIAM TAYLOR, superintendent of the Walden Knife Works, Walden, N. Y., died August 15, 1922, at his home in Walden, aged 45.

Book Reviews

Official report of the Ninth National Foreign Trade Convention at Philadelphia, May 10, 11 and 12, 1922. 8 x 9-in. 621 pages. Issued by the Secretary of the National Foreign Trade Council, New York, N. Y.

If one needed to be convinced of the general interest in foreign trade, a perusal of this volume would surely dispel any illusions to the contrary. The volume contains the addresses and discussions of the convention, which were given by title and outline at the time in these columns. The addresses cover foreign loans, depreciated currency, need of foreign trade, effect of high taxation, teaching of economics, credits and acceptances, net prices and discounts, merchant marine, insurance, bonded service, arbitration; European, South American and Far Eastern business, agriculture, exchange, financing, exports, co-operation, use of information and advertising, foreign trade policies, and such matters.

One of the most impressive addresses, and one which should be studied by business men generally, whether they are directly interested in export or not, was delivered by Walter Lichtenstein, Ph.D., of the First National Bank of Chicago, Ill. Under the title of "Need for Imports to Pay for Exports" he points out many obvious truths which are too often overlooked by business men as well as legislators. He shows plainly that exports must mean imports as well, and that artificial barriers to import make export more difficult, if not impossible. This address alone will well repay securing a copy of the volume for one's reference library.

Aircraft Year Book, 1922. 6 x 9-in. Two hundred and forty-six pages. Published by the Aeronautical Chamber of Commerce, New York, N. Y.

The year book of the aircraft industry has become an institution which chronicles the progress of our latest method of transportation, a method which is soon to be much more prominent than at present. The book reviews the advance of commercial aviation, the status of laws governing aviation and the need for others, accomplishments of other nations and many other subjects. The achievements of the air force in bombing the battleships is given in detail and with illustrations.

There are six chapters in the book, which occupy the first 160 pages. The appendix which follows includes data on the activities of the War and Navy Departments, the Marine Corps, Air Mail Service, Forest Fire Patrol and many other departments and committees. Details of performance are of interest, such as 6,500,000 miles flown during the year, with 250,000 passengers. Twice each day planes fly from coast to coast. The four new records made in America are of interest: Altitude, 35,563 ft.; seaplane with four people, 19,500 ft.; plane remains aloft over 26 hours; and a speed record of 174.77 miles per hour on a closed course. Those who want to know what has been done, and who can gather from the past what the future may have in store, need this book at hand as a reference. It is well written and fully illustrated, including outline drawings of many planes and motors.

Radiators for Aircraft Engines. By S. R. Parsons and D. R. Harper, 3rd, physicists. One hundred and eighty-three pages, 150 illustrations and tables. Published by Bureau of Standards, Washington, D. C. Price, 50 cents.

While this forms Technologic Paper 211 of the Bureau of Standards publications, it is in reality a handbook on radiators, based on extended experiments during the war and since. In addition to recording these special investigations, the paper contains a full description of laboratory methods and instruments for those tests of radiator cores which can be made in the laboratory. Results are tabulated giving the physical properties and geometrical characteristics of the various cores tested. Performance characteristics of sixty-six types of core are given in graphical form, and empirical equations for relating the heat dissipating power of a radiator to the air flow through the core, for computing the performance of a core of any depth from that of a core of exactly similar construction but different depth, and for computing heat dissipating power of such cores from their geometrical dimensions, are included.

The effectiveness of indirect cooling surface, that is, cooling surface not backed by flowing water, is developed mathematically, reduced to a practical working equation and applied to computation of the best fin dimensions for given conditions. Also, the equations of thermal conductivity are applied in order to produce a table showing temperature drop through metallic water tubes of radiators having various wall thicknesses of different kinds of material. The effect upon heat dissipation of varying the rate of water flow is considered in detail, also a comparison of different methods of testing radiator cores calorimetrically; and a great many other topics having to do with the performance of the radiator in different positions and at different altitudes are discussed.

Pattern Making. By Sampson and McCracken. Published by D. Van Nostrand & Co., 8 Warren St., New York, N. Y. One hundred and eleven 8 x 10½-in. pages. Thirty full-page plates and 85 halftone illustrations.

This book was written to fill the need for a text that would give students such a knowledge of pattern making as to enable them to make a pattern of any usual type. Beginning with general information as to kinds of patterns generally used, and defining such subjects as shrinkage, finish, draft, cores and core prints, a chapter on pattern details follows. Here pattern lumber is thoroughly discussed and a full explanation given of the way it should be sawed and glued in building up patterns.

In a section devoted to tools, all the hand tools and machines used by pattern makers are illustrated and described. Molding is taken up in such a way as to give the student a fair idea of how a pattern is to be used in the foundry, together with a full description of foundry equipment and its use.

The foregoing chapters are followed by thirty exercises for students, in which detailed drawings of a variety of articles are given with full instructions for making patterns for them. In the plates with the drawings are many illustrations showing how the patterns are to be molded. Students finishing the course prescribed in this book should have attained a good working knowledge of the general principles of pattern making.

Pamphlets Received

250 Lacquer Questions Answered. Zeller Lacquer Manufacturing Co., Inc., 342 Madison Ave., New York City. An interesting pamphlet of 28 pages with a complete index. It contains as its title implies, 250 questions regarding lacquer, its composition, use, methods of application and other points of interest. These are clearly answered in language easy to understand. To the great numbers of people who desire information on lacquers this pamphlet should fill a long felt want.

Engineering Service. Ford, Bacon & Davis, Inc., 115 Broadway, New York City. Pamphlet No. 46 describing in detail this company's engineering organization and the broad scope of its service.

How Electric Riveting Was Made Commercial. A pamphlet and catalog combined, containing sixteen pages by Frank P. Kobert, published by the Kobert Machine Co., Inc., 50 Church Street, New York City. The pamphlet is a detailed discussion of the process of electric riveting with illustrations of the machinery used in the operation.

Establishing Branch Factories in Germany. Trade information Bulletin No. 52 published by the Department of Commerce, being a report to the Secretary of Commerce by the Western European Advisory Committee consisting of Fred I. Kent, Rudolph S. Hecht, Clyde L. King, Alexander Legge, George M. Verity. Distributed by the U. S. Department of Commerce, Washington, D. C.

Trade Catalogs

Insulating Compounds. The Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa. A booklet of sixteen pages, known as Publication No. 4249-A describing the company's line of insulating and soldering compounds. Some of the materials treated in the publication are baking varnishes, air-drying varnishes, insulating compounds, finishing materials, insulating glue, soldering flux, and lubricating oil.

Heat Treating Furnaces. The Chicago Flexible Shaft Co., Chicago, Ill. An illustrated folder showing the numerous types and sizes of the Stewart heat treating furnaces, with dimensions and other data on each size.

Micarta Gears. The Westinghouse Electric and Manufacturing Co., Pittsburgh Pa. An illustrated folder, known as Folder No. 4453, enumerating the points of superiority claimed for micarta gears and showing the advantages to be derived from the use of Micarta in place of their nonmetallic gears.

Electric Hoists. The Northern Engineering Works, Detroit, Mich. Bulletin No. 544-DD, just issued, describing in detail the company's electrically operated portable hoists in sizes ranging from ¼ to 1 ton. The hoist is made for either direct or alternating current and complete specifications are set forth in tabular form in the bulletin.

Measuring Instruments and Tools. The Van Keuren Co., 362 Cambridge St., Allston, Boston, Mass. A new catalog of 8 pages, just issued, and known as catalog No. 25. The catalog contains a foreword on the Van Keuren Service, quality and guarantee, and gives detailed information with cuts on the company's line of gage blocks, plug gages, measuring wires, surface plates and outfits for measuring light waves.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Annual convention, Sept. 11 to 15 at the new auditorium, Cleveland, Ohio. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

American Institute of Mining and Metallurgical Engineers, annual convention, Sept. 25 to 28, 1922, San Francisco, Cal. Secretary, F. F. Sharpless, 29 West 39th Street, New York City.

American Society of Mechanical Engineers, regional meeting, Sept. 25, 26 and 27, 1922, Hotel Kimball, Springfield, Mass. Secretary Calvin W. Rice, 29 West 39th Street, New York City.

American Society for Steel Treating. Exposition and convention at the General Motors Co., Building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

American Gear Manufacturers' Association. Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

American Manufacturers Export Association annual convention. New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Buck Falls, Pa., (Delaware Water Gap).

National Machine Tool Builders' Association, annual convention. New York City, October, 1922. Secretary, E. F. Du Brul, 817 Provident Bank Building, Cincinnati, Ohio.

National Founders Association. Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922. Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Shapes, plates and bars up 10c.; cold rolled steel, 15c.; floor plates, 20c.; hoops and soft steel bands, 25c. per 100 lb. in New York warehouses. Chicago quotes advance of 10c. on shapes, plates, bars and soft steel bands; 20c. on floor plates; 22c. on hoops and 30c. on cold rolled steel. Mill price of shapes, plates and bars, $1.80@$2 per 100 lb., f.o.b. Pittsburgh. Bars quoted at $2 and plates at $2@$2.25 per 100 lb. on small tonnages for quick deliveries. Wrought steel pipe discounts reduced in New York warehouses; no change, as yet, on Pittsburgh basing card of leading interest. Price advances due to further reduction in output and higher production costs, caused by scarcity of coal and coke.

Tin up ¾c. in New York warehouses. Copper demand better; prices firm. Aluminum ingots advanced 1c. and antimony ½c. per lb. in Chicago. Lead quiet; prices higher, however, in St. Louis.

Declines—Dealers' purchasing price of old copper, heavy, and crucible, down ½c. per lb. in Chicago. Zinc market easier; St. Louis quotes 6.15c. as against 6.30c. per lb. Linseed oil down 4c. per gal. in Chicago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.55
Northern Basic	28.27
Southern Ohio No. 2	27.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	32.44
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.64
Virginia No. 2	30.17
Basic	27.25
Grey Forge	31.50
CHICAGO	
No. 2 Foundry local	30.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.00
Basic	26.00
Bessemer	27.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Cincinnati	15.0	10.0	4.75
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cleveland	8.75	6.5	4.5
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40@2.60	3.78	3.50	3.90
No. 12	2.45@2.65	3.83	3.55	3.95
No. 14	2.50@2.70	3.88	3.60	4.00
No. 16	2.70@2.90	3.98	3.70	4.10
Black				
Nos. 17 and 21	3.00@3.25	4.15	3.80	4.60
Nos. 22 and 24	3.05@3.30	4.20	3.85	4.60
Nos. 25 and 26	3.10@3.35	4.25	3.90	4.65
No. 28	3.15@3.40	4.35	4.00	4.75
Galvanized				
Nos. 10 and 11	3.15@3.40	4.35	3.85	5.60
Nos. 12 and 14	3.25@3.50	4.45	3.95	5.70
Nos. 17 and 21	3.55@3.80	4.75	4.25	6.00
Nos. 22 and 24	3.70@3.95	4.90	4.55	6.15
No. 26	3.85@4.10	5.05	4.70	6.30
No. 28	4.15@4.40	5.35	5.00	6.60

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¼ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¼ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	63%	49%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	60%	46%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	4.03	3.50	3.70
Cold rolled strip steel	6.50	8.25	6.15
Floor plates	5.00	4.91	5.28
Cold finished shafting or screw	3.65	3.30	3.70
Cold finished flats, squares	4.15	3.80	4.20
Structural shapes (base)	2.93	2.66	2.80
Soft steel bars (base)	2.83	2.56	2.70
Soft steel bar shapes (base)	2.83	2.56	2.70
Soft steel bands (base)	3.63	3.06	3.45
Tank plates (base)	2.93	2.66	2.80
Bar iron (2.25 at mill)	2.83	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.62½
Tin, 5-ton lots, New York			33.25
Lead (up to carlots), St. Louis 5.55; New York			6.10
Zinc (up to carlots), St. Louis 6.15; New York			7.00
	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	19.00
Antimony (Chinese), ton spot	5.50	7.50	6.50
Copper sheets, base	21.00	21.50@21.75	23.00
Copper wire (carlots)	16.50	17.50	16.25
Copper bars (ton lots)	19.50	22.50	19.50
Copper tubing (100-lb. lots)	23.75	24.50	23.00
Brass sheets (100-lb. lots)	17.75	19.50	18.75
Brass tubing (100-lb. lots)	21.50	22.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	16.25	17.50	15.75
Brass wire (carlots)	18.25	19.50	.....
Zinc sheets (casks)	8.50	9.00	.....
Solder (½ and ½), (caselots)	23.00	23.50	20.00
Babbitt metal (fair grade)	24.50	42.00	36.00
Babbitt metal (commercial)	11.12½	16.00	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	51
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	11.50
Copper, heavy, and wire	11.75	11.00	11.25
Copper, light, and bottoms	9.75	9.50	10.25
Lead, heavy	4.75	4.50	4.50
Lead, tea	4.25	3.50	3.50
Brass, heavy	7.00	6.00	9.00
Brass, light	6.00	5.00	6.25
No. 1 yellow brass turnings	6.50	6.00	6.75
Zinc	3.00	3.25	3.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC.	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.11½
Cotton waste, mixed, per lb.	.055@.09	.09	.08
Wiping cloths, 13½x13½, per lb.	.075	.10	.10
Wiping cloths, 13½x20½, per lb.	.08	.11	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.91	1.17	.97
White lead, dry or in oil	100 lb. kegs.	New York,	12.50
Red lead, dry	100 lb. kegs.	New York,	12.50
Red lead, in oil	100 lb. kegs.	New York,	14.00
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		14.00
Coke, prompt foundry, Connellsville	per net ton		15.00

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50-10%
1½ and 1½x3 in. up to 12 in	25%	65%	60-10%
With cold punched sq. nuts	30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	.....	$4.00 off
Button head bolts, with hex. nuts	20%	$3.90 net	.....
Hex. head and hex. nut bolts	25%	.....	65-5%
Lag screws, coach screws	45%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in.: 30 in.	35%	50-10-5%	50-5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	10%	.....	.....
Semi-finished nuts ⅝ and larger	65%	70-10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	55%	65%	60-10%
Rivets, tinned	55%	65%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$4.50	$3.50	$3.35
Cone heads, ditto (net)	4.60	3.60	3.45
1½ to 1½-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50-%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	30-5%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100,			
Paper	1.32	.....	1.40
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Conn., Norwalk—Ericksons Garage, rear Commerce St—one drill press (used).

Fla., Sebring—J. O. Adams—equipment for machine and repair shop.

Ind., Indianapolis—Rockford Mfg. Co., 2001 English Ave.—equipment for proposed 1 story machine shop.

N. J., Wildwood—W. Butterfield—machine shop equipment, including lathe, drill press, etc.

N. Y., Buffalo—D. Patton, 498 Elk St.—tools for proposed repair and plumbing shop.

N. Y., Buffalo—A. Schmidt, Doat St.—equipment and machinery for garage, service station, and repair shop on Genessee St. and Ralph Pl.

N. Y., Chautauqua—C. S. Arnold, Colonnade Bldg., machinery and equipment for proposed garage, capacity 500 cars.

N. Y., Elmira—Ellet-Stemple Co., 112 Lake St.—equipment for proposed repair and plumbing shop.

N. Y., Jamestown—S. B. Robbins, 303 Lafayette St.—machinery and tools for proposed garage and service station on North Main St.

N. Y., Rochester—Auto Sales & Service Corp., 228 Williams St.—mechanical equipment, machinery, and tools for proposed ($150,000) salesroom and service station on Monroe Ave.

N. Y., Rochester—J. Cullinan, 29 Thorndale Terrace—machinery, tools and other mechanical equipment for proposed garage and service station on Lake Ave.

O., Celina—Hermann Mfg. Co.—metal working machinery, including grinder, shaper and polisher.

O., Massillon—The Standard Steel Rolling Mill Co.—grinder.

Okla., Madill—Woody Motor Co.—equipment for machine shop and service station.

Pa., Chester—G. Silver, 4th and Edgemont Sts.—welding outfit, set of tinners' and sheet metal workers' tools.

Pa., Morrisville—Free Bridge Motors Co. lathes and other machinery for proposed machine shop and garage on Bridge St.

Pa., Phila.—Commercial Truck Co., 27th and Brown Sts.—one 36 in. Bullard vertical lathe.

Pa., Phila.—De Frain Sand Co., Beach and Berks Sts.—one 20 in. x 14 ft. lathe, one 24 in. shaper and one 20 in. drill press.

Pa., Phila.—Sayre Level Radio Co., 41 North 10th St.—drill pressed lathes, etc., for new factory.

Pa., Phila.—A. Schriver, 1013 Cherry St.—one 6 in. swing 5 ft. bed power lathe.

Wis., Menasha—C. A. Westberg, 644 Paris St. (manufacturer of printing machinery)—lathe, millers, shapers, drill presses, and grinders.

Ont., Dresden—O. & W. McVean, Ltd.—12 in. engine lathes, back geared, with compound rest.

Ont., Walkerville—Gotfredson Joyce Co., Walker Rd. (manufacturer of auto trucks) —metal working machinery, special equipment and tools for proposed addition to factory.

Machinery Wanted

Ala., Bessemer—J. P. K. Harless, Box 229—one 12 x 18 ft. power press and other printing equipment.

Ala., Montgomery—Atlanta Ice & Cold Storage Co.—complete machinery and equipment for addition to ice and storage plant.

Ark., Hot Springs—Missouri Lumber Co., Gaines Ave.—machinery and equipment for mill.

Calif., Long Beach—Long Beach Paper Box Co.—machinery and equipment for proposed factory on Cherry Ave.

Conn., Bridgeport—The Raybestos Co., Railroad Ave. and Bostwick Ave. (manufacturer of asbestos brake linings, etc.), A. D'Louhy, Purch. Agt.—one belt press.

Conn., Bridgeport—M. J. Dowling & Co., 576 Gurdon St. (building specialties, equipment, etc.), J. H. Southey, Purch. Agt.—one 3 ton capacity chain hoist block (used).

Conn., Fairfield—G. Grenier, 140 Grasmere Ave. (novelty and mechanical work) —small tools, also one 4 hp. electric motor.

Conn., Poquonock Bridge (Groton P. O.) —H. E. Thurber—one band saw (used).

Del., Wilmington—Bd. of Harbor Comrs., Public Bldg., will receive bids until Sept. 8, for one railroad track scale, 200 ton capacity.

3 steam locomotive cranes, 20 ton capacity, 50, 60 and 70 ft. boom.

2 light duty traveling electric portal cranes, 2½ ton capacity.

4 portable electric dock winches, 2 ton capacity.

1 mechanical cargo ramp.

6 electric tractor trucks, with two spare batteries.

3 load carrying trucks.

50 trailers for electric tractors.

50 stevedore hand trucks.

Ga., Rome—Battery Machine Co., A. Butler, Purch. Agt.—1 self feed rip saw with 2 saws spaced 11 in. apart.

Ga., Waynesboro—J. D. Sanders—one tenoning machine, single head, to use for cutting tenon on wagon crossbars (used).

Ill., Chicago—Western Newspaper Union, 210 South Desplaines St.—one No. 14 linotype.

Ill., Rockford—Andrews Wire & Iron Works, 1802 Preston St.—special iron and wire working machinery for use in the manufacture of ornamental wire work.

Ia., Bloomfield—Bloomfield Messenger, Box 566, F. R. Sullivan, Purch. Agt.—newspaper and job press, power.

Ia., Grundy Center—J. Rosekamp—syrup and sugar making and mixing machinery.

Kan., Wichita—Wichita Trunk Co., South Lawrence St., E. Rose, Purch. Agt.—power planer and drill press.

Ky., Augusta—Ohio Valley Publishing Co., P. O. Box 121—two news presses, 3 job presses, 1 linotype machine, belting, shafting, hangers, pulleys, and other printing equipment.

Ky., Cynthiana—Cynthiana Carriage Co., J. W. Leek, Pres.—machinery and equipment for proposed plant at Covington, Ky.

Ky., Madisonville—Kentucky Tire Pump Co.—machinery and equipment for proposed plant at Evansville, Ind.

La., New Orleans—Kotteman Furniture Co., 4101 Magaine St.—machinery and equipment for the manufacture of window shades.

La., Shreveport—Sunshine Soap Co., Inc. —machinery and equipment for the manufacture of soap and soap products.

La., Tioga—Lee Lumber Co.—machinery and equipment for $100,000 saw mill.

Mich., Detroit—The City, Herman Kiefer Hospital, Byron Ave.—coal hopper, grinder, traveling weigh larry, pivoted belt conveyor, capacity 40 ton per hour.

Minn., Albert Lea—Central Clay Wks.—full equipment for modern tile plant.

Minn., Duluth—Duluth Burial Case Co., 218 West 2nd St.—machinery for proposed burial casket factory.

Mo., Joplin—C. McManamy, 2220 Pearl St. (mine operator)—Keystone drill.

Mo., Kansas City—Central Printing Co., 124 West 13th St.—cylinder press.

Mo., Marshall — International Shoe Co. machinery and equipment for proposed $250,000 addition to factory.

Mo., St. Joseph—Aunt Jemima Mills Co., 2nd and Edmond Sts. (food manufacturing) —testing machinery (Mullens preferred).

Mo., St. Louis—Julius Meyer Printing & Publishing Co., 2107 East Prairie St.—one type caster.

Nev., Sparks—I. G. Wagner—refrigerating and ice manufacturing machinery, for proposed plant at Marysville, Cal.

N. Y., Attica—W. Ranger—one hollow chisel mortising machine, to mortise ¼th to ¾th.

N. Y., Buffalo—Jewett & Co., Military Rd., S. S. Jewett, 563 West Ferry St., Pres. —machinery and equipment for stove and range factory.

N. Y., Buffalo—Wood & Brooks Co., Military Rd. (manufacturer of mechanical players)—machinery and equipment for proposed addition to plant.

N. Y., Frewsburgh—F. Gurnsey, Route 86—large power threshing machine separator with side stacker.

N. Y., Ithaca—Morse Chain Co., South Tioga St.—machinery and equipment for proposed factory in Detroit, Mich.

N. Y., Jamestown—Emerson Glass Corp., 148 Blackstone Ave., manufacturer of mirrors, glass products, etc.—equipment and machinery for silvering mirrors.

N. Y., Jamestown—International Casement Co., 84 Hopkins Ave., manufacturer of steel window screens and frames—machinery and equipment for factory addition now in course of construction.

N. Y., LeRoy—Ralph Gypsum Co.—machinery and equipment for mining and development of gypsum field.

N. Y., Long Island City—Wengraf Mfg. Co., 29 Prospect St., (manufacturer of cranes)—chain blocks, 1 ton and 2½ ton.

N. Y., New York City—Continental Paper & Bag Mills, 16 East 40th St.—one 36 x 40 two column printing press for power equipment.

N. Y., Niagara Falls—P. Lonberger, 1623 8th St.—one 2 ton hoist for truck.

N. Y., North Rose — North Rose Cold Storage Plant, Orchard St.—machinery and equipment for addition to storage plant, capacity 30,000 barrels.

N. Y., Seneca Falls—Seneca Falls Rule & Block Co., 19 Water St.—10 x 15 or 12 x 18 job presses.

N. C., Concord—A. B. Pounds—electrically operated 25-ton ice machine, and other equipment, for ice manufacturing plant.

N. C., Gastonia—Art Cloth Mills, Inc., H. H. Gagner, Pres.—textile machinery for proposed large plant.

O., Cleveland—The City of Cleveland—one 10 ton gasoline driven locomotive crane.

O., Cleveland—The Crucible Steel Castings Co., Champlain and Canal Rd.—one 5 ton electric crane, sand blast equipment, cupola and motors, for proposed plant.

O., Columbus—Amicon Fruit Co., 81 East Naghten St.—machinery and equipment for 3 story cold storage and refrigeration plant at Williamson, W. Va.

O., Columbus—Clark Grave Vault Co., 344 West Town St., A. F. Beck, Pres. and Genl. Mgr.—1 breaker for steel, and other equipment for proposed plant.

O., Lima—The Lima Locomotive Co., South Main St.—$500,000 worth of various equipment for new plant.

Okla., Barnsdale (P. O. Avant)—C. A. Runyan—power job press, paper cutter, and other printing equipment.

Okla., Cushing — Cushing Refining & Gasoline Co.—machinery and equipment for proposed extension to refinery at Ingall, Okla., also equipment for new gasoline producing plant.

Pa., Allentown — Channock & Senderowitz—machinery and equipment for proposed 3 story cigar factory.

Pa., Hazleton—D. Markle—machinery and equipment for development of coal mining properties near Tremont, Pa.

Pa., Ice Lake (White Haven P. O.)—Miller Powder Works (manufacturer of explosives)—machinery and equipment for proposed enlargement of plant.

Pa., Phila. — Branch — Crawford Co., (metal manufacturers) 27 South 4th St.—punch press, inclineable table, 4 in. stroke or over.

Pa., Phila. — Fennessey & Kobler Co., 26th and Parrish Sts., A. Fennessey, Purch. Agt.—wood and metal working machines for the manufacture of automobile bodies.

Pa., Phila.—R. Krook, Main St. and Walnut Lane, manufacturer of yarn—additional mule spindles and sets.

Pa., Phila.—Montgomery & Snow, Montgomery and Moscher Sts., A. Snow, Purch. Agt.—Textiles—drying machines for dyeing plant.

Pa., Phila.—A. J. Reach & Co., Tulip and Palmer Sts., A. Gamble, Purch. Agt.—mule spindles, belts, shaftings, etc., for the manufacture of yarn.

Pa., Phila.—F. C. Sneadaker & Co., 9th and Tioga Sts., mill work—additional woodworking machinery.

Pa., Phila.—United Lutheran Publication Co., 9th and Sansom Sts.—machinery for printing plant (new).

Pa., Pittsburgh—D. N. Carlin Co., 125 Dennison St. (manufacturer of toys)—machinery and equipment for proposed addition to factory.

Pa., Pittsburgh—Du Roth Steel Truck & Car Wheel Co., 611 Keystone Bldg. — equipment for new plant at Osgood, Pa.

Pa., Pittsburgh—Kund & Eiben Co., 204 Warrington Ave.—1 self feed rip saw, 3 cut off saws, and 1 band saw, 1 planer, 2 moulders, 1 jointer, 1 sander, 1 tenon and 1 boring machine, 1 shaper, 1 concrete mixer, 1 cement block machine, and 1 Ford tractor, for cabinet works at Bedford.

Pa., Wilkes-Barre—A. L. Reilly, Archt., Bennett Bldg.—vocational equipment for proposed high school at Plains, Pa.

Tex., Dallas—Edwards Wheel & Body Works, 2801 Main St.—power polishing machine, belt sanding machine, and a 20 to 25 hp. motor.

Tex., Stamford—Jay Cotton Oil Co.—machinery for cotton oil mill.

Va., Lynchburg—Apex Coal Co.—machinery and equipment for proposed coal tipple and other coal mining plants at Sargent, Ky.

Wash., Chehalis—Coy Valve Co.—complete machinery and equipment for proposed plant.

W. Va., Wheeling—Bd. of Educ., 2105 Chapline St., C. E. Githens, Supt.—equipment for vocational departments of schools.

Wis., Appleton—The Valley Dairy Products Co.—machinery for proposed dairy.

Wis., Carrollville (P. O. Otjen)—U. S. Fertilizer Co.—special machinery to extract fumes and gases from commercial fertilizer while in process of manufacture.

Wis., De Pere—The City, W. R. Mathews, Clk.— manual training equipment for proposed vocational school.

Wis., Kenosha — The Nash Motors Co., Edward St., C. W. Nash, Pres.—iron and woodworking machinery for the manufacture of automobiles.

Wis., Lake Geneva—J. Nutini—dairy machinery for proposed ice cream factory.

Wis., Madison—Madison Gas & Electric Co., 120 East Main St.—mono rail crane.

Wis., Marshfield — Cahill & Douglas, Engrs., 216 West Water St., Milwaukee, are receiving bids for bucket conveyor, 40 ft. long, belt or chain type, for Roddis Lumber and Veneer Co., Marshfield.

Wis., Medford — Medford Marble & Granite Works, F. J. Barry, Purch. Agt.—cutting machinery for monument working.

Wis., Menasha—Jaeger-Wheeler Co., 417 2nd St.—machinery for auto repair shop at Neenah (proposed).

Wis., Milwaukee—Seaman Body Corp., 1732 Richards St.—woodworking and iron working machinery.

Wis., Milwaukee—Standard Oil Co., 68 Wisconsin St.—gasoline storage tank and pump for garage at Green Bay.

Wis., Milwaukee—L. Windler, 1218 23rd Ave.—trim saw and pulling machine for wood working.

Wis., Oshkosh—Kaewer Auto Co., Main and Irving Sts.—air tank, complete with pump, for proposed addition to garage.

Wis., Racine—Belle City Malleable Iron Co., Kewaunee St.—annealing ovens.

Wis., Racine—V. E. Christiansen, 1242 Goold St.—one electrically driven floor surfacing machine.

Wis., Wauwatosa—Milwaukee County Bd. of Trustees, Watertown Plank Rd., W. L. Cuffey, Mgr.—receiving bids until Aug. 28 for refrigerating machinery.

Wis., West Allis—Allis Chalmers Mfg. Co.—one 10 ton traveling crane.

Ont., Georgetown—Smith & Stone Electrical Co., College View—equipment for porcelain kilns.

Ont., Guelph—McArthur Engineering Co. —latest modern gravel and sand handling and washing equipment, for gravel pit.

Every one of these items is reported by our authorized correspondents who are instructed to verify every item sent in. Everything possible is done to insure authenticity and timeliness. This free weekly service is published in the interests of the buyer and the seller, to bring them together and get machinery moving. Your co-operation is invited.

BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

Ont., Hamilton—Libbey Owens Sheet Glass Co.—equipment for proposed extension to plant.

Ont., London—McCormick Biscuit Co., Dundas St. E., F. McCormick, Mgr.—electric ovens and baking equipment. Estimated cost $30,000.

Ont., St. Thomas—St. Thomas Metal Signs, Ltd.—cylinder press for sheet metal 36 x 60 in., 9¼ in. between table and ram.

Ont., Scarboro Junction—Kingston Road Lumber Co., 828 Kingston Rd.—complete machinery and equipment for proposed planing mill.

Ont., Sudbury—Cochrane Hardware Co. —electric floor scrapers.

Ont., Woodstock—The Oxford Knitting Co., Ltd. (manufacturer of underwear)—W. A. Gray, Secy.-treas.—latch needle machines in 10-cut with different sized cylinders, (Scott and Williams, also Wildman); 28 gauge spring needle machines different sized cylinders (Tompkins).

Metal Working Shops

Calif., Oakland—Hebern Electric Code, Inc., Bank of Italy Bldg., had plans prepared for the construction of a 3 story factory on Harrison St. between 8th and 9th Sts. Estimated cost $200,000. Reed & Corlett, Oakland Bank of Savings Bldg., Archts.

Calif., Santa Rosa — B. Hildebrand, Archt., Santa Rosa, is receiving bids for the construction of a 2 story, 75 x 150 ft. garage for Tilden & Tilden. Estimated cost $40,000.

Ill., Chicago—B. H. Gwathmey, 1508 East 66th Pl., awarded the contract for the construction of a 1 story, 91 x 127 ft. garage at 1947-53 East 57th St. Estimated cost $40,000.

Mass., Boston—Fisher Hill Co., 18 Tremont St., will build a 3 story, 80 x 170 ft. garage, repair shop and service station, on Commonweaith Ave. Estimated cost $100,000.

Mass., Nantasket—L. Damon, Jr., Hull, awarded the contract for the construction of a 1 story, 100 x 110 ft. garage and warehouse, on Atlantic Ave. Estimated cost $40,000.

N. Y., Buffalo—Jewett & Co., Military Rd., plans to build a plant for the manufacture of stoves and ranges, to replace one destroyed by fire. Estimated cost $150,000. S. S. Jewett, 563 West Ferry St., Pres. Architect not announced.

N. Y., Chautauqua—Chautauqua Institution—The Colonnade plans to rebuild its garage destroyed by fire, capacity 500 cars. Estimated cost $50,000. A. E. Bestor, Pres. C. A. Arnold, Colonnade Bldg., lessee.

N. Y., Jamestown—S. B. Robbins, 303 Lafayette St., has purchased a site on North Main St. and plans to build a garage and service station. Estimated cost $45,000. Architect not announced.

O., Cleveland—W. B. Gongwer, Federal Bldg., is interested in a syndicate which plans to build a 3 and 6 story garage, commercial and office building at 3328 Euclid Ave. Estimated cost $400,000. W. S. Lougee, 500 Marshall Bldg., Archt.

O., Cleveland—Pollock-Davis Co., 11628 Euclid Ave., had plans prepared for the construction of a 1 story, 72 x 74 ft. garage. Estimated cost $40,000. H. P. Whitworth, 526 Hickox Bldg., Archt.

O., Cleveland—G. S. Rider & Co., Archts., Century Bldg., is receiving bids for the construction of a 1 story, 100 x 240 ft. foundry on Almira Ave. and East 82nd St., for the Crucible Steel Castings Co., Canal Rd. Estimated cost $100,000. W. H. Shepard, Pres. Noted July 6.

Okla., Madill—Woody Motor Co. plans to build a service station and garage to replace the one destroyed by fire. Estimated cost $60,000. Architect not announced.

Pa., Ambridge—Standard Seamless Tube Co., plans to build a 1 story, 80 x 480 ft. addition to its plant. Private plans.

Pa., Johnstown—J. Walling & Co., 518 Washington St., is having plans prepared for the construction of a 3 story, 74 x 132 ft. garage, on Railroad St. Estimated cost $15,000. S. E. Dickey & Co., Johnstown, Engrs. Noted June 22.

Pa., Morrisville—Free Bridge Motors Co. plans to build a 2 story, 86 x 86 ft. machine shop and garage on Bridge St. Estimated cost $10,000. O'Rourke & Haig, 87 Liberty St., Trenton, Archts.

Pa., New Kensington — National Auto Service Co. plans to build a 1 story, 60 x 70 ft. and 25 x 60 ft. garage and service station, on 5th St. Estimated cost $50,000.

Pa., Phila.—J. T. Finnessey, Taney and Parish Sts., awarded the contract for the construction of a 1 story, 25 x 80 ft. shop for the manufacture of automobile bodies. Estimated cost $17,000.

R. I., Providence—United Electric Railways Co., Union Station, plans to build a 1 and 2 story, 88 x 250 ft. garage and service repair station on Melrose St. Estimated cost $100,000. Private plans.

Wis., Appleton—G. R. & S. Motor Co., 738 Washington Ave., awarded the contract for the construction of a 1 and 2 story, 30 x 75 ft. garage. Estimated cost $50,000. Noted Aug. 10.

Wis., Milwaukee—Seaman Body Corp., 1732 Richards St., is receiving bids for the construction of a 5 story factory for the manufacture of auto bodies. Private plans.

Wis., Neenah—Jaeger-Wheeler Co., 417 2nd St., Menasha, is having plans prepared for the construction of a 2 story, 60 x 120 ft. garage and repair shop, on Commercial St., here. Estimated cost $50,000. E. A. Wettengel, 578 Pierce Ave., Appleton, Archt.

Wis., Oshkosh—Kaewer Auto Co., Main and Irving Sts., awarded the contract for the construction of a 1 story, 64 x 130 ft. garage addition. Estimated cost $40,000.

Wis., Oshkosh—Winnebago County Road and Bridge Comn., 535 7th St., is receiving bids for the construction of a 1 story, 58 x 120 ft. garage, on Wisconsin Ave. O. Laabs, Chn. Estimated cost $40,000.

Wis., Waukesha—Waukesha Fdry. Co., Lincoln Ave., has selected a site and plans to build a 2 and 3 story, 50 x 195 ft. steel factory and foundry, on Lincoln Ave. Estimated cost $50,000. Architect not selected.

Ont., Walkerville—Gotfredson Joyce Co., Walker Rd., manufacturer of auto trucks, awarded the contract for the construction of a 70 x 100 ft. addition to its factory. Estimated cost $50,000.

Ont., Windsor—Gray Dort Motors, Ltd., 1 William St., N., Chatham, plans to build a new auto factory, here. Estimated cost $100,000. Private plans.

Que., Lachine—Linde Canadian Refrigeration Co., St. Peters St., Montreal, awarded the contract for the construction of a factory here, for the manufacture of refrigerating machines. Estimated cost $40,000. Architect not announced.

General Manufacturing

Ark., Hot Springs—Missouri Lumber Co., Gaines Ave., plans to rebuild its lumber mill which was recently destroyed by fire. Estimated cost $75,000. Private plans.

Calif., Dinuba — The Sun Maid Raisin Growers, Holland Bldg., Fresno, awarded the contract for the construction of an 80 x 140 ft. packing plant, here. A. V. B. Klein, asst. operating mgr. Noted June 22.

Calif., San Francisco—A. M. E. Danner, c/o J. H. Hjul, Engr., 1342 Mission St., awarded the contract for the construction of a 1 story, 25 x 85 ft. printing plant on 7th St., near Howard St., to be occupied by C. F. Danner Publishing Co., 45 Ecker St. Estimated cost $8,000.

Conn., Hamden—Safety Car Heating & Lighting Co., Dixwell Ave., awarded the contract for the construction of 2 one story, 106 x 115 ft. and 100 x 195 ft. factory additions. Estimated cost $100,000.

Conn., South Norwalk—J. and J. Cash, Ltd., Chestnut St., will soon award the contract for the construction of a 1½ story, 60 x 132 ft. weave shed, for the manufacture of textiles. Estimated cost $40,000.

Ill., Chicago — P. Gerhardt, Archt., 64 West Randolph St., is receiving bids for the construction of a 3 story, 120 x 240 ft. printing plant on La Salle St. near 26th St., for the Illinois Publishing and Printing Co., Hearst Bldg. Estimated cost $500,000.

Ill., Chicago — F. Mack, 1914-16 Milwaukee Ave., manufacturer of leather goods, awarded the contract for the construction of a 3 story, 35 x 50 ft. factory addition. Estimated cost $25,000.

Kan., Salina—H. D. Lee Flour Mills, had plans prepared and soon receives bids for the construction of a 23 x 63 ft. cleaner house, 95 ft. high, and a grain elevator, on Santa Fe Ave. Estimated cost $150,000. I. L. Zerbe, Salina, Archt. and Engr.

La., New Orleans—Bd. of Port Comrs., 1 Canal St., plans to build a 3 story, 140 x 325 ft. grain sacking plant, adjoining cotton warehouse. Estimated cost $180,000.

Mass., Holyoke—Holyoke Supply Co., 210 Race St., manufacturer of plumbing goods, awarded the contract for the construction of a 5 story addition to its plant. Estimated cost $50,000.

Mass., Southbridge—Hamilton Woolen Co., Mill St., awarded the contract for the construction of a 1 story, 100 x 120 ft. warp room addition to its plant on West St. Estimated cost $40,000.

Minn., Albert Lea — Central Clay Wks. plans to build a tile factory to replace one recently destroyed by fire. Estimated cost $40,000. A. L. Severin, Mgr. Engineer not selected.

Minn., Duluth—Duluth Burial Case Co., 218 West 2nd St., will soon award the contract for the construction of a 2 story, 41 x 123 ft. casket factory at 203 West 2nd St. Estimated cost $30,000.

Minn., Winona — Pepin Pickling Co. awarded the contract for the construction of a 1 and 2 story, 74 x 141 ft. canning factory and warehouse. Estimated cost $50,000. Noted June 1.

N. J., Trenton—Freeman Electric Co., 809 East State St., awarded the contract for the construction of a 1 story, 32 x 100 ft. addition to its porcelain plant. Estimated cost $20,000.

N. Y., Boonville—Bd. of Educ., awarded the contract for the construction of a 3 story, 109 x 142 ft. school on Ford and Post Sts., to replace one destroyed by fire. Estimated cost $185,000.

N. Y., Buffalo—D. Patton, 498 Elk St., plans to build a repair and plumbing shop at 470 Elk St. Estimated cost $6,000. Architect not announced.

N. Y., Buffalo—A. Teachout & Son, 52 Leslie St., plans to rebuild that portion of its planing mill which was destroyed by fire. Estimated cost $15,000.

N. Y., Jamestown—Emerson Glass Corp., 146 Blackstone Ave., manufacturer of mirrors, glass products, etc., plans to build an addition to its factory. Estimated cost $5,000. Private plans.

N. Y., Jamestown—Ulrich Plan File Co., 516 West 4th St., awarded the contract for the construction of a factory for the manufacture of vertical filing equipment for offices, etc., on Murray Ave. Estimated cost $18,000. Noted June 29.

N. Y., Newburgh — W. R. Crabtree awarded the contract for the construction of a yarn mill. Estimated cost about $150,000.

N. C., Gastonia — The Art Cloth Mills, Inc., plans to build a weave mill, to be equipped with seventy-two 30 harness novelty looms. Estimated cost $195,000. H. D. Gayner, Pres.

N. C., Granite Falls—A. A. Shuford Mill Co., Highland, plans to build a cotton mill, here. Estimated cost, exclusive of machinery and equipment, $100,000.

O., Cleveland — Christian, Schwarzenberg & Gaede, Archts., 1900 Euclid Ave., are receiving bids for the construction of a 1 story factory addition, for Wolf Envelope Co., 1749 East 22nd St. Estimated cost $50,000. Noted Aug. 17.

O., Cleveland — The Lincoln Heights Dairy Co., c/o J. Terenca, 755 Starkweather Ave., had plans prepared for the construction of a 2 story, 35 x 78 ft. factory at 2504 Professor Ave. Estimated cost $40,000. W. Markowitz, 1836 Euclid Ave., Archt.

O., Cleveland—G. Rackle & Sons Co., Stop 5, A. B. C. Line, manufacturer of artificial stone, had plans prepared for the construction of a 1 story, 50 x 120 ft. molding shop on McCracken Rd. Estimated cost $40,000.

O., Cleveland—A. Sogg, Archt., Hippodrome Bldg., is receiving bids for the construction of a 2 story, 35 x 50 ft. factory and store building, on East 105th St. and Superior Ave., for J. O. Stein, 822 Leader-News Bldg. Building to be leased to Hoffman Candy Co., c/o architect.

O., Cleveland—D. D. Wessels & Son, 1785 East 17th St., manufacturer of sanitary tubs, are receiving bids and will open same about Aug. 30, for the construction of a 2 story, 100 x 102 ft. factory at 2009 Oregon Ave. Estimated cost $60,000. Private plans.

O., Middletown—The Gardner Harvey Paper Co., West 3rd St., is receiving bids for the construction of a 1 story, 200 x 396 ft. paper manufacturing plant. T. H. Scott & Son, Middletown, Archts.

Okla., Duncan—Pauline Oil & Gas Co. plans to build a refinery, capacity 700 bbls., on site 6 miles from here. Estimated cost $65,000.

Pa., Arnold—Amer. Window Glass Co., Farmers Bank Bldg., Pittsburgh, awarded the contract for the construction of a 1 story, 120 x 142 ft. box factory.

Pa., Bedford—Kund & Eiben Co., 204 Warrington Ave., Pittsburgh, will build a 1 story, 60 x 170 ft. cabinet works, here. Private plans.

Pa., Glenshaw—Ball Chemical Co., Fulton Bldg., Pittsburgh, is having plans prepared for the construction of a 2 story, 64 x 113 ft. manufacturing and storage building, on Butler Plank Rd., here. Estimated cost $50,000.

Pa., Kulpmont—W. L. Connell Coal Co., 416 Lacka Ave., Scranton, Pa., is having plans prepared for the reconstruction of its coal washery, here. Estimated cost $50,000. Engineer not announced.

Pa., Phila.—C. D. Heavey, 1110 North Front St., awarded the contract for the construction of a 2 story, 20 x 66 ft. repair shop. Estimated cost $7,000. Private plans.

Pa., Phila.—R. Krook, Main St. and East Walnut Lane, awarded the contract for the construction of a 1 story, 72 x 80 ft. factory for the manufacture of textiles. Estimated cost $20,000. Private plans.

R. I., Pawtucket—Solway Dyeing & Textile Co., Ingrahamville, awarded the contract for the construction of a 1 story, 70 x 140 ft. textile plant addition. Estimated cost $40,000.

S. C., Clover—Hampshire Spinning Co., awarded the contract for the construction of a 3 story, 133 x 294 ft. mill. Product to be 50's to 70's combed yarns, packed on cones.

Tex., Houston—Houston Gas & Fuel Co., 607 San Jacinto St., plans to make extensive improvements to its gas manufacturing plant, including enlargement of holder, etc. Estimated cost $110,000.

Tex., Sabine—Magnolia Petroleum Co., plans to rebuild that portion of distributing plant destroyed by fire. Estimated cost $170,000. Architect not announced.

Tex., Stamford—Jay Cotton Oil Co., plans to build a 125 ton daily capacity cotton oil mill.

W. Va., Weirton—The Weirton Steel Co. awarded the contract for the construction of a complete coke and bi-products plant, consisting of about 40 ovens, at their mills, here.

Wis., Appleton—The Valley Dairy Products Co. awarded the contract for the construction of a 2 story, 60 x 80 ft. dairy. Estimated cost $50,000. Noted Aug. 3.

Wis., De Pere—The City, W. R. Mathews, Clk., plans to build a 2 story vocational school. Estimated cost $150,000. Architect not selected.

Wis., Green Bay—Standard Oil Co., 68 Wisconsin St., Milwaukee, awarded the contract for the construction of a 1 story, 52 x 110 ft. garage and warehouse, here. Estimated cost $40,000.

Wis., Lake Geneva—J. Nutini awarded the contract for the construction of a 1 story, 50 x 90 ft. ice cream factory. Estimated cost $40,000.

Wis., Milwaukee—S. E. Tate Printing Co., 133 2nd St., is having preliminary plans prepared for the construction of a 6 story, 60 x 120 ft. printing plant and office building. M. Tullgren & Sons, 425 East Water St., Archts.

Wis., Racine—H. & M. Body Corp., 608 Center St., awarded the contract for the construction of 1 story, 100 x 240 ft. dry kilns. Estimated cost $125,000.

Ont., Georgetown—Smith & Stone Electrical Co., College View, is having plans prepared for the construction of porcelain kilns. Estimated cost $40,000.

Ont., Hamilton — Libbey Owens Sheet Glass Co. is preparing plans for extending its plant. Estimated cost $250,000. H. Allen, Mgr. Private plans.

Ont., Scarboro Junction—Kingston Road Lumber Co., 828 Kingston Rd., plans to build a planing mill. Estimated cost $25,000. Private plans. Architect not announced.

Que., Asbestos—Johns Manville Co., Ltd., 450 St. James St., Montreal, reported planning erection of plant, here. Estimated cost $1,000,000.

Que., Montreal—Burton Brewery Co. of Canada, plans to build a 3 story, 100 x 300 ft. brewery on St. Dennis and De Valier Sts. Estimated cost $400,000. B. H. Anglin, Pres.